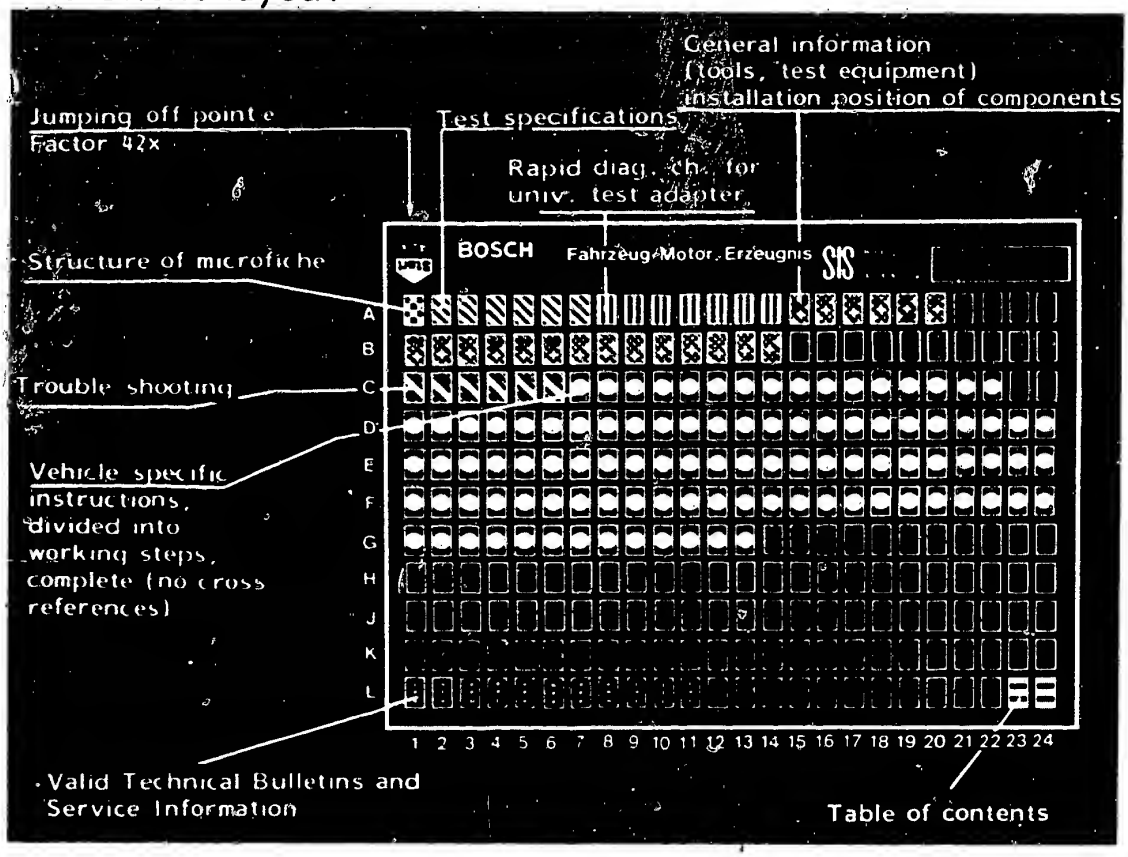
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

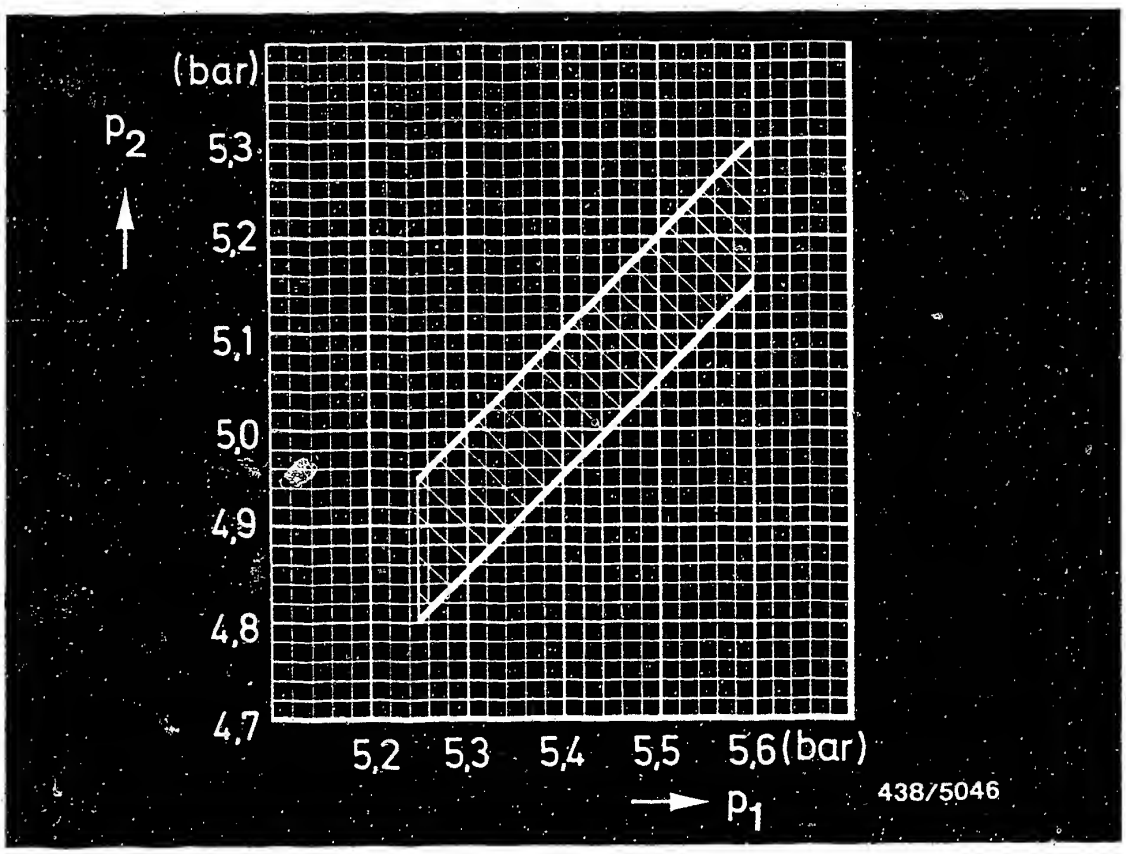
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

1. Test Specifications

Test step	Test specifications*
1.1 Electric fuel pump:	**D1**
Fuel delivery:	min. 1100 cm^3/min.
1.2 Fuel pressures:	**D7**
Primary pressure:	5.25 ... 5.6 bar 5.35 ... 5.7 kp/cm^2

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm^2 (gauge pressure)

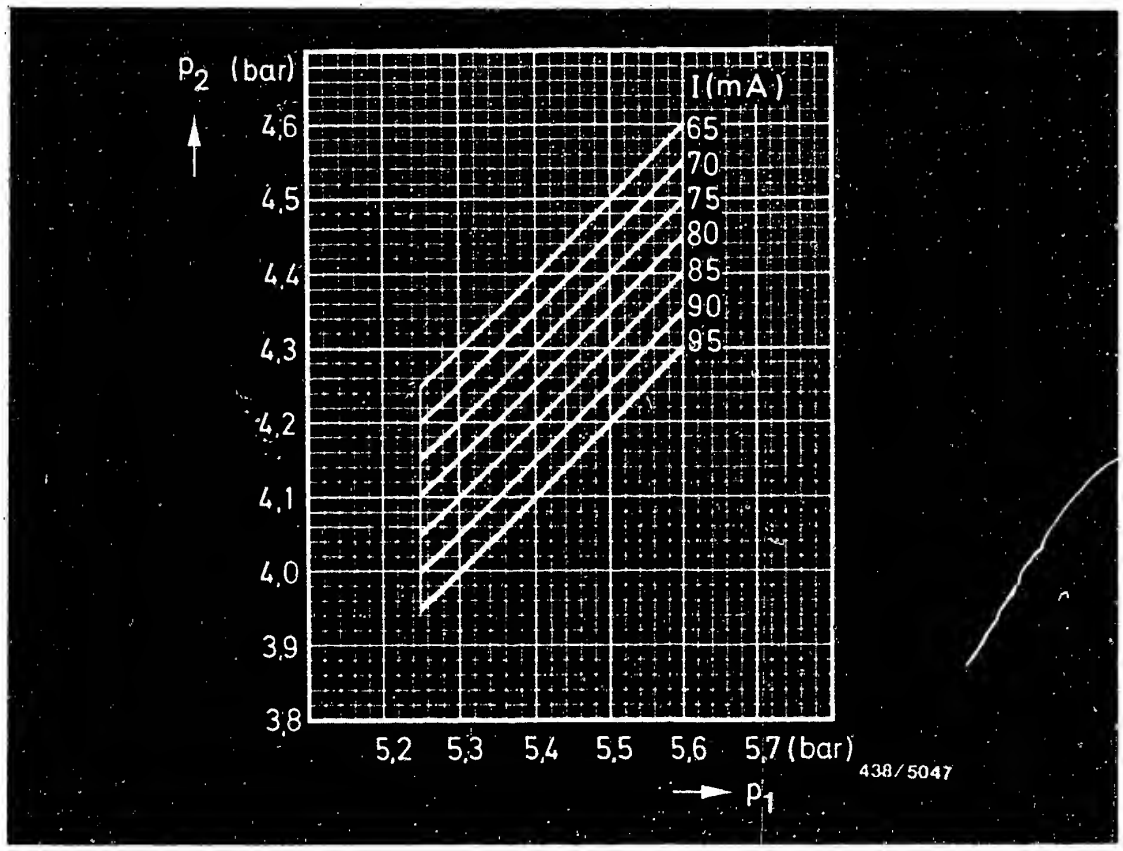


p_1 = Primary pressure
p_2 = Lower-chamber pressure, controller current = 0 mA

Differential pressure:
(Primary pressure/lower-chamber pressure)

D11

Take the "warm" lower-chamber set-value pressure from the graph in accordance with the measured primary pressure. The "warm" state is simulated by removing the plug from the pressure controller (controller current 0 mA).



p_1 = Primary pressure

p_2 = Lower-chamber pressure "cold". Tolerance ± 0.15 bar

I = Controller current

D 11

Take the "cold" lower-chamber set-value pressure from the graph in accordance with the measured primary pressure and the measured controller current. The "cold" state is simulated by removing the plug from the temperature sensor (NTC). Connect the plug to the pressure controller.

Test step	Test specifications*
1.3 Leak test on overall fuel system: **D21**	
Minimum pressure after 10 min:	2.7 bar (2.8 kgf/cm²)
after 20 min:	2.6 bar (2.7 kgf/cm²)
1.4 Injection valve: **E7**	
Opening pressure:	3.0...4.1 bar (3.1...4.2 kgf/cm²)

1.5 Fuel distributor test: **E15**
(Test with pressure controller mounted. Pressure controller deenergized).

Comparative measurement of deliveries from outlets:	Setting point	Max. allowable delivery
Idle:	6.0 cm³/min	6.6 cm³/min
Part load:	40.0 cm³/min	42.5 cm³/min
Full load:	100.0 cm³/min	109.0 cm³/min
Full load with maximum deflection of air-flow sensor plate. Minimum delivery of all outlets:	140.0 cm³/min	----

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications

1.6 Temperature sensor — **F9**

Resistance measurements:

Engine cold. Ambient temperature (+15°C...+30°C):	1300...3600Ω
Engine at normal operating temperature (approx. +80°C):	250...390Ω

1.7 Thermo-time switch — **D3**

Resistance measurements:

At temperature	Resistance measurements between Term. "G" and ground (housing)	Term. "W" and ground (housing)	Term. "G" and term. "W"
below 0°C	75...110Ω	0Ω	75...110Ω
above +10°C	75...110Ω	∞Ω	∞Ω

1.8 Air-flow sensor potentiometer: — **F17**

Voltage signal with air-flow sensor plate in basic position:	0.2...0.3 V

1.9 Auxiliary-air device: — **C21**

Resistance of heating coil:	30...65Ω

Test step	Test specifications
1.10 Idle adjustment:	
Idle speed:	750...850 min^{-1}
Idle CO concentration:	0.5...1.5 %by vol. CO

2. Rapid diagnosis chart for universal test adapter ETT 018.01 with KE-Jetronic test lead 1 684 463 135 and suitable multimeter:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electrical/electronic functions of the KE-Jetronic peripherals and control unit.

If detailed information is required on trouble-shooting and testing, always proceed in accordance with the trouble-shooting chart (Coordinates C1...C6).

Important note on the following rapid diagnosis chart:

The "Test conditions" column shows for which test steps the control-unit plug must be connected or disconnected.
Always ensure that the ignition is off whenever connecting or disconnecting.

Rapid diagnosis chart for universal test adapter ETT 018.01

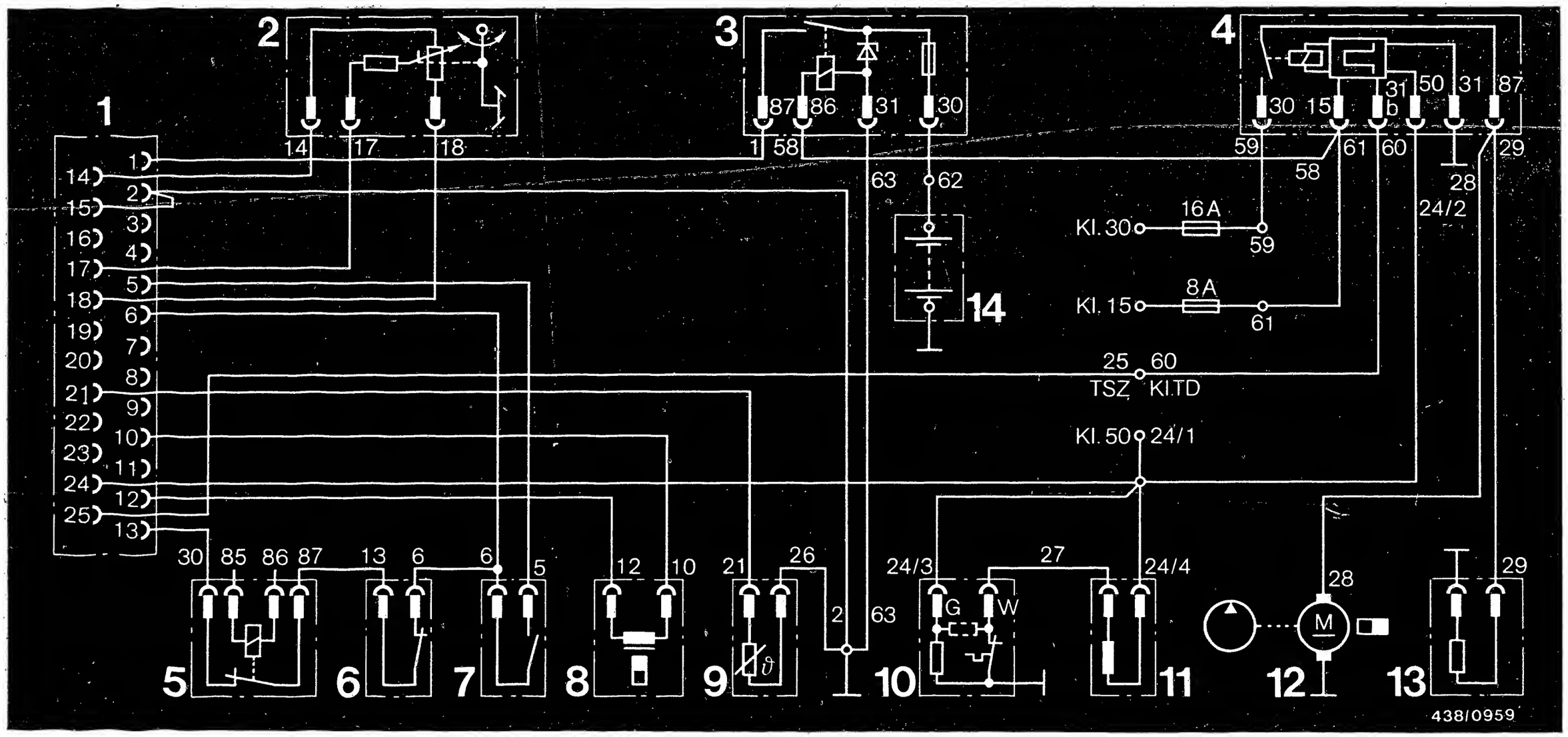
Test step	Switch position V	Switch position Ω	Button	Object under test	Test connections	Test conditions	Test specifications (Reading)	For trouble-shooting see
1	↓	4	-	Pressure controller internal resistance	12-10	Disconnect control unit plug	21...25Ω	F 9
2	↓	5	-	Temperature sensor internal resistance +15...+30°C approx. +80°C	21-2	Control-unit plug disconnected.	1.3...3.6kΩ 250...390Ω	F 9
3	↓	9	-	Throttle-valve switch "idle"	13-6	Control-unit plug disconnected. Throttle valve closed. Open throttle valve by hand.	∞ Ω 0 ... 10 Ω	F 11
4	↓	10	-	Throttle-valve switch "full load"	5-6	Control-unit plug disconnected. Throttle valve closed. Throttle valve fully open.	0 ... 10 Ω ∞ Ω	F 11
5	4	-	-	Starting signal	24-2	Control-unit plug disconnected. Operate starting motor.	8 ... 15 V	F 13
6	5	-	-	TD signal	25-2	Control-unit plug disconnected. Operate starting motor for a few seconds.	U undef.	F 13
7	6	-	-	Control unit supply	1-2	Control-unit plug disconnected. Switch on ignition.	8 ... 15 V	F 13
8	7	-	-	Air-flow sensor potentiometer supply	18-2	Switch off ignition. Connect control unit. Switch on ignition.	7.0...8.0 V	F 15

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

Test step	Switch position V	Switch position Ω	Button	Object under test	Test connections	Test conditions	Test specifications (reading)	For trouble shooting see
9	8	-	-	Air-flow sensor potentiometer signal	17-2	Control unit connected. Switch on ignition. Deflect air-flow sensor plate by hand. Voltage rise from 0 to max. 8.0 V	0...8.0 V	F 17
10	9	-	-	Throttle-valve switch supply	6-2	Control unit connected. Switch on igntion.	7.0...8.0 V	F 19
11	-	-	1	Warm-up enrichment - 20°C	12-12	Control unit connected. Switch on ignition.	40...60 mA	F 21
12	-	-	2	Controller current, corresponding to engine at normal op. temp.	"	Control unit connected. Switch on ignition.	0 ... 1 mA	F 21
13	-	-	4	Starting enrichment	"	Control unit connected. Switch on ignition. Test specification must be reached while button is actuated.	130...150 mA	F 23
14	-	-	1/4	Post-start enrichment	"	Control unit connected. Switch on ignition. Keep button 1 pressed. After releasing button 4 the test specification remains for a short while and this is followed by a slow settling to the test specification in test step 11.	80...120 mA	F 23

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

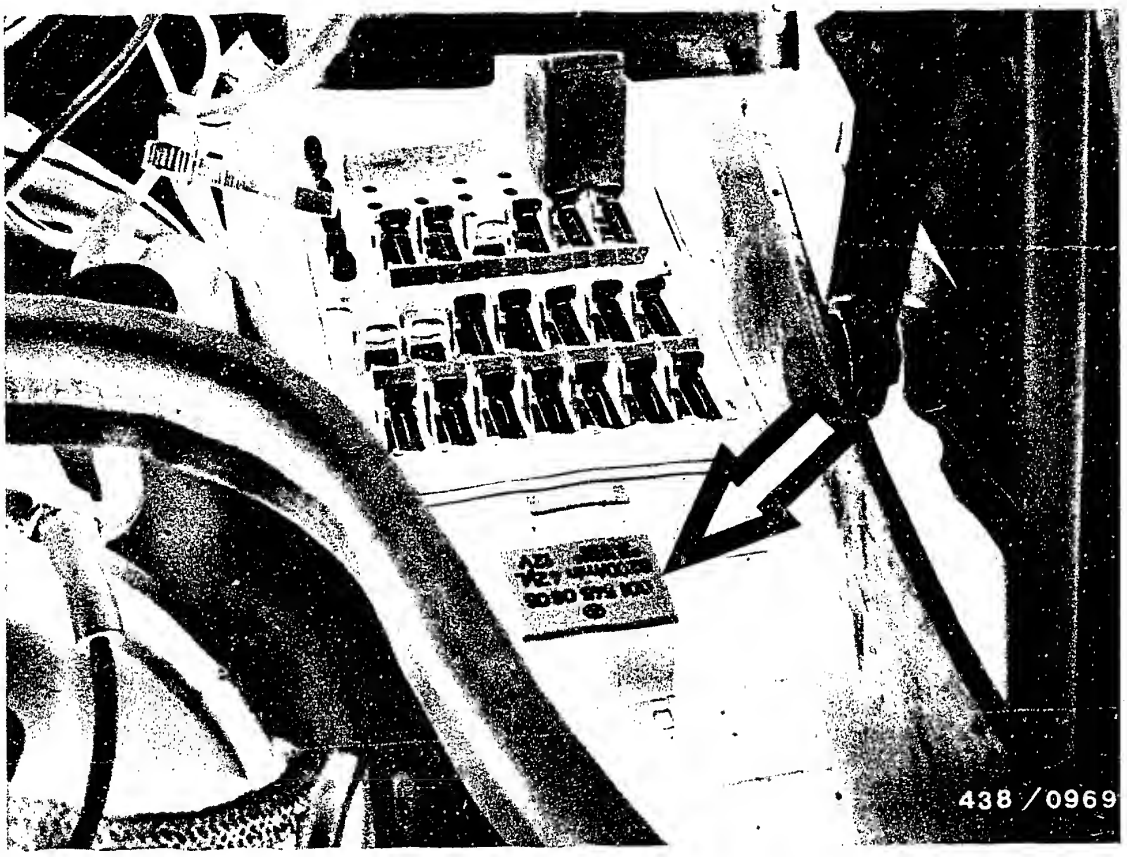
Test step	Switch position V	Switch position Ω	Button	Object under test	Test connections	Test conditions	Test specifications (reading)	For trouble shooting see
15	-	-	1/6	Acceleration enrichment	12-12	Control unit connected. Switch on ignition. Keep both buttons pressed. Reading as per test specification in test step 11. Then deflect air-flow sensor plate. Reading rises (130... 150 mA) and falls again very quickly.	130...150mA	G 1
16	-	-	6	Full-load enrichment	"	Control unit connected. Start engine and hold engine speed at 1800 min^{-1}.	4.5...7.5mA	G 3
17	-	-	2	Overrun cutoff	"	Control unit connected. Start engine. Change connections of ammeter (swop + and -). Hold engine speed at approx. 1400...1500 min^{-1} while button is actuated and actuate throttle-valve switch idle contact by hand. Engine hunts. The test specification (-40...-50 mA) is indicated as engine speed drops.	-40... -50 mA	G 5



3. Electrical safety circuit

3.1 Electrical terminal diagram of KE-Jetronic

1 = Electronic control unit
2 = Air-flow sensor potentiometer
3 = Electronic relay with overvoltage protection
4 = Engine-speed relay for safety circuit (pump relay)
5 = Cruise control relay (Optional extra)
6 = Throttle-valve switch Idle
7 = Throttle-valve switch Full load
8 = Electrohydraulic pressure controller
9 = Temperature sensor (NTC)
10 = Thermo-time switch
11 = Start valve
12 = Electric fuel pump
13 = Auxiliary-air device
14 = Battery

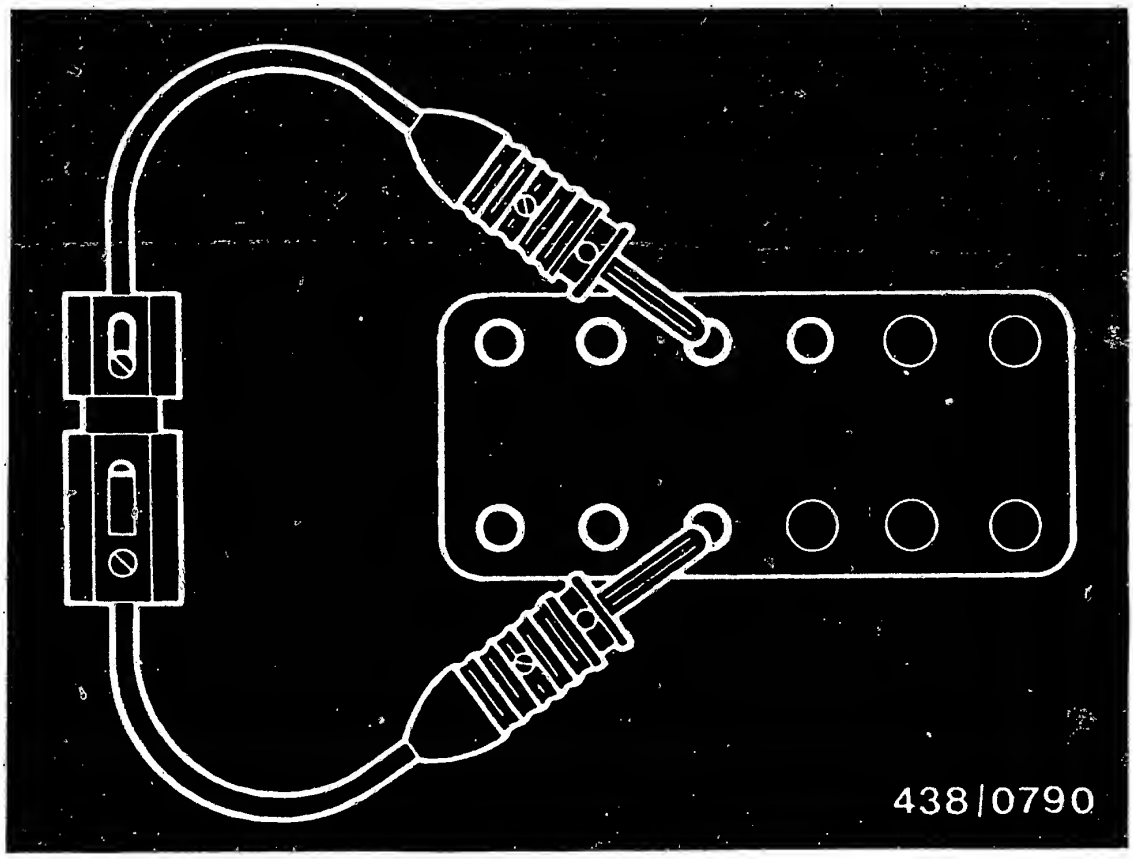


3.2 Bridging the electrical safety circuit

For all pressure and flow tests it is necessary to bridge the electrical safety circuit for the electric fuel pump and auxiliary-air device.

To do this, remove the cap and the electronic engine-speed relay (arrow) from the relay base.

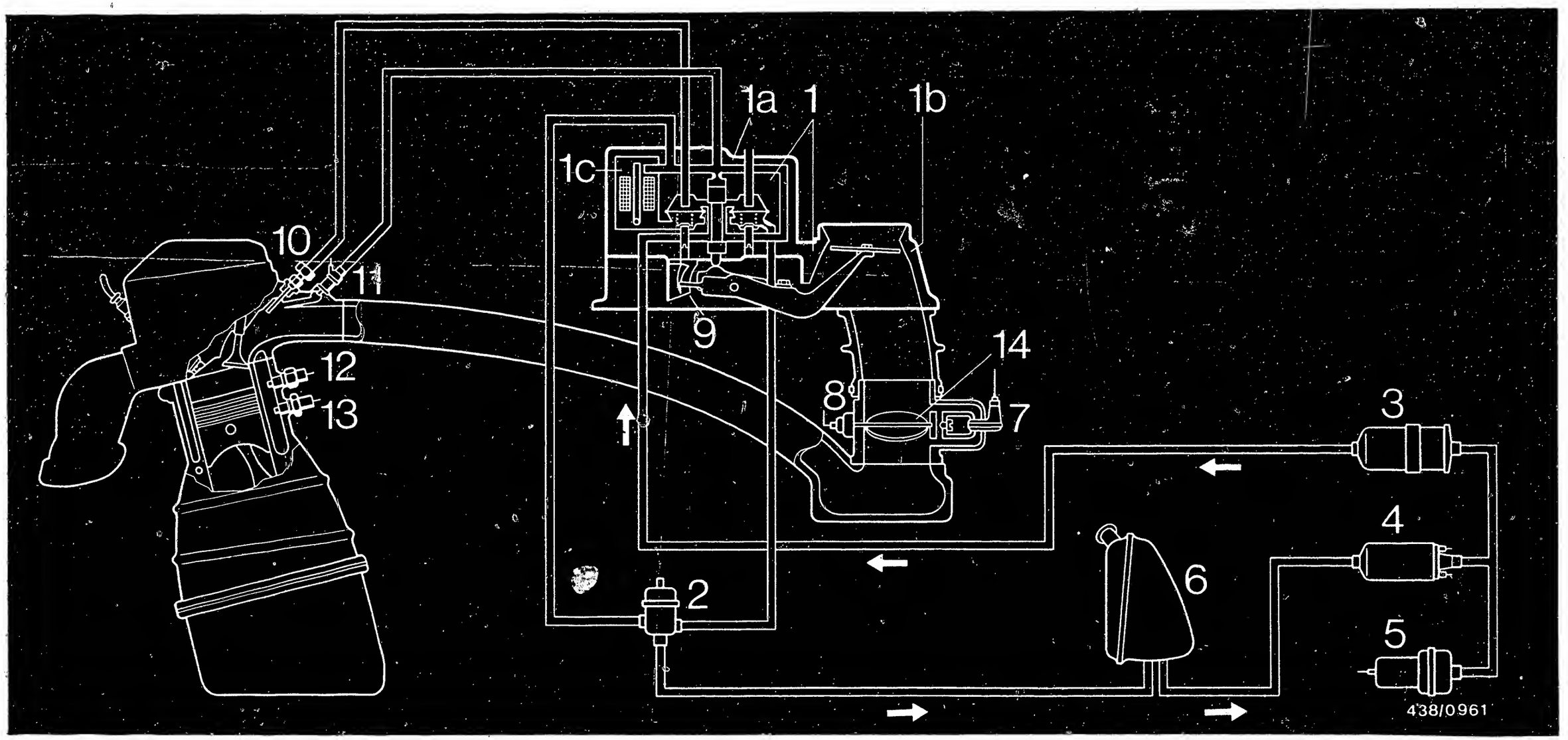
Note:
As of the 1984 model the electronic engine-speed relay is on the right-hand side in the forward direction of travel, next to the KE-Jetronic control unit.



Bridge pins 7 (87) and 8 (30) in the relay base using connecting cable. Use connecting cable 1.5 mm² with fuse holder and 16 A fuse (to be user-fabricated as per sketch).

The electric fuel pump and auxiliary-air device are now supplied with battery voltage.

Important:
For testing the control unit functions it is sufficient to switch on the ignition. The safety circuit must not be bridged in this case. This ensures that no fuel is injected when the air-flow sensor plate is moved. This would lead to serious engine damage when subsequently starting the engine.



4. Diagram of fuel lines in KE-Jetronic

1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electrohydraulic pressure controller
2 = Pressure regulator (primary pressure)
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Auxiliary-air device
8 = Throttle-valve switch - full load (idle contact on linkage)
9 = Air-flow sensor potentiometer
10 = Injection valve
11 = Start valve
12 = Thermo-time switch
13 = Temperature sensor (NTC)
14 = Throttle valve

5. General information

5.1 Introduction:

This microfiche deals with all testing and repair operations on the KE-Jetronic in the Daimler-Benz 190 E. All the components of the KE-Jetronic are dealt with in the individual test steps with the corresponding test specifications.

The KE-Jetronic is a further development of the known K-Jetronic, but in this system all the corrections which are necessary in practice are controlled by electronic means.
The basic mechanical/hydraulic principle is largely the same as that employed in the K-Jetronic, but the separate control-pressure circuit with control-pressure regulator (warm-up regulator) is dropped.

In order to carry out the testing operations described in this microfiche and to assess the components, you should be familiar with the KE-Jetronic and how it works. Reference is made in this connection to Technical Bulletin "New Product" VDT-I-438/3 which describes the construction and operating principle of the system in detail.

When trouble-shooting the KE-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

- All mechanical, hydraulic and electrical test specifications.

- A test chart for the Bosch universal test adapter for testing all electrical/electronic functions.

- A list of the necessary test equipment and special tools and illustrations of the installation position of all components.

The test specifications and the test chart each contain a reference to the coordinates in which each test step is described in detail.

The trouble-shooting chart on Coordinates C1 to C6 is intended to make it easier to decide which test steps have to be performed for which faults. In accordance with the complaint stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate reference at the end of the cause column refers to the appropriate test step with all the necessary information and instructions.

5.2 Important information for general work on vehicles with KE-Jetronic:

- Never start engine without securely connected battery.
- Never disconnect battery from vehicle electrical system with engine running.
- Disconnect battery from vehicle electrical system when fast charging.
- Remove the KE-Jetronic control unit at temperatures above 80°C (paint-drying installation).

- Remove the KE-Jetronic control unit before carrying out electrical welding work (e.g. spot welding).
- Make sure that all wiring-harness plugs are securely connected.
- Never disconnect or connect wiring-harness plug of control unit with ignition on.

5.3 Important information for working on the KE-Jetronic:

If any fuel connections are loosened, or parts removed, also on the vacuum system, always use new seals when re-connecting or when re-installing.

Ensure utmost cleanliness when working on the KE-Jetronic. Thoroughly clean fuel connections on the outside before loosening.

When carrying out testing operations with the electric fuel pump operating, never deflect (press down) the air-flow sensor plate since fuel will then be injected through the injection valves. This can lead to extremely serious engine damage when subsequently starting the engine.

5.4 Additional equipment on the mixture-preparation system:

The KE-Jetronic in the Daimler-Benz 190 E corresponds to the basic design as described in Technical Bulletin "New Product" VDT-I-438/3.

Vehicles with automatic transmission and air conditioner or automatic air-conditioning system are also equipped with idle-speed stabilization. This consists of two solenoid-operated change-over valves each with an air bypass valve.

Operation of idle-speed stabilization:

When an additional load is put on the engine (drive mode selection or refrigerant compressor) the corresponding solenoid-operated change-over valve opens through electrical energization and establishes a vacuum connection to the corresponding bypass valve. The application of vacuum opens the bypass valve and the engine is supplied with an additional quantity of air which bypasses the throttle valve. This quantity is such that the desired increase or stabilization in engine speed is achieved.

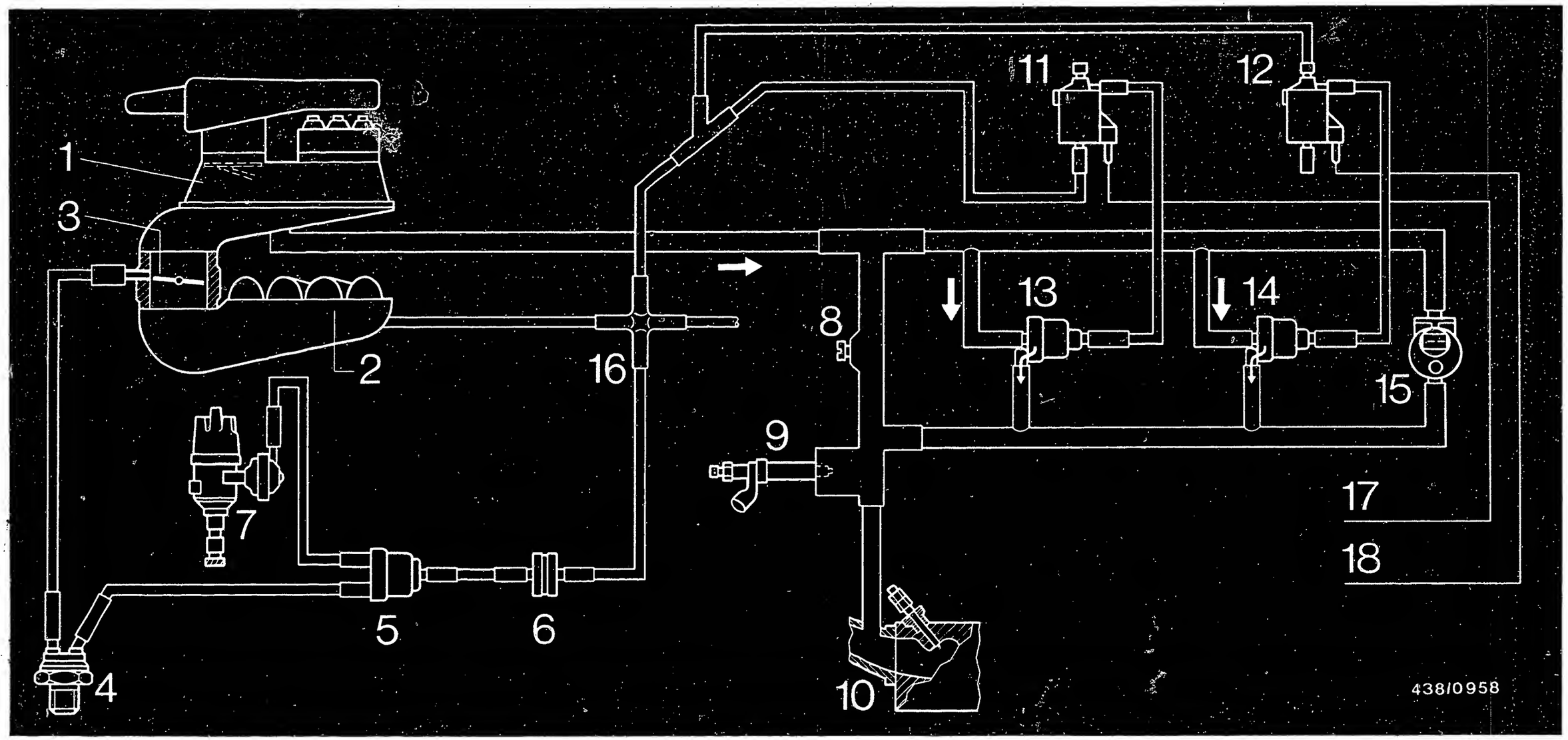
There is a system of colour-coding to show which valve belongs to which system.

Solenoid-operated change-over valves

Vacuum lines red = Air conditioner
Vacuum lines yellow = Automatic transmission

Bypass valve white = Air conditioner
Bypass valve yellow = Automatic transmission

The following diagram shows the arrangement of the various components in the vacuum system.



Arrangement of components for idle-speed stabilization

1 = Mixture-control unit
2 = Intake manifold
3 = Throttle valve
4 = Thermo-valve, white, approx. +80°C
5 = Non-return valve
6 = Restriction, white/green
7 = Ignition distributor
8 = Idle adjustment bypass screw
9 = Start valve
10 = Cylinder head - intake manifold
11 = Change-over valve (engine-speed stabilization - automatic transmission)
12 = Change-over valve (engine-speed stabilization - air conditioner)
13 = Bypass valve, yellow
14 = Bypass valve, white
15 = Auxiliary-air device
16 = Connection for other loads
17 = Selector lever position signal
18 = Temperature controller signal

6. Test equipment and tools

- Universal test adapter ETT 018.01 - 0 684 101 801
  For testing the electrical/electronic functions of the system.

- KE-Jetronic test lead 1 684 463 135
  Used in conjunction with the test adapter.

- Multimeter
  Used in conjunction with the test adapter.
  Commercially available (e.g. Miselco Master 50 k).

- Pressure tester KDJE-P 100
  For testing all fuel pressures and for testing the system for leaks.

- Connecting-parts sets KDJE-P 100/10 and .../11
  For connecting the pressure tester.

- Valve tester KDJE-P 400
  For testing the injection valves.

Test fluid: Test gasoline.

Bosch order designation VS 14 942-CH (previously part number 5 973 340 650). The Bosch test gasoline can be obtained in 5-litre cans from the following supplier:

Oskar Gnamm & Co
D-7531 Kämpfelbach-Bilfingen

- Tester for delivered quantity comparison KDJE-P 200
  For comparative measurement of the fuel deliveries from the individual outlets of the fuel distributor.

- Line set KDJE-P 200/25
  For connecting the tester for delivered quantity comparison.

- Adjusting wrench KDEP 1035
  For exhaust-gas adjustment.

- Setting device KDJE 7456
  For setting and locating the position of the air-flow sensor plate.

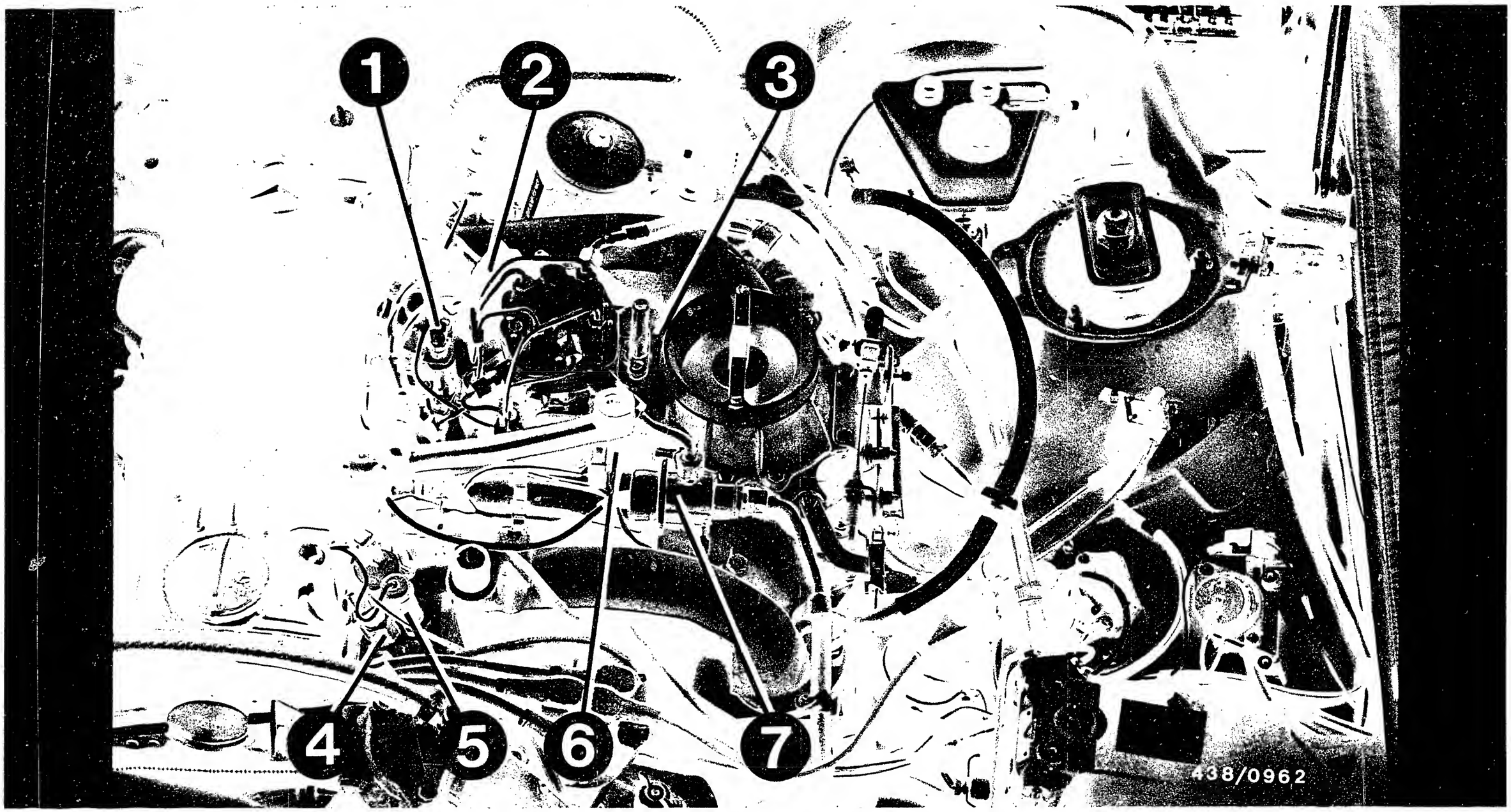
- Graduate, approx. 1.5 l capacity
  Commercially available, for measuring the delivery of the electric fuel pump.

- Electric connecting cable KDJE 7450/70
  For direct connection of components under test.

- Tachometer (commercially available)

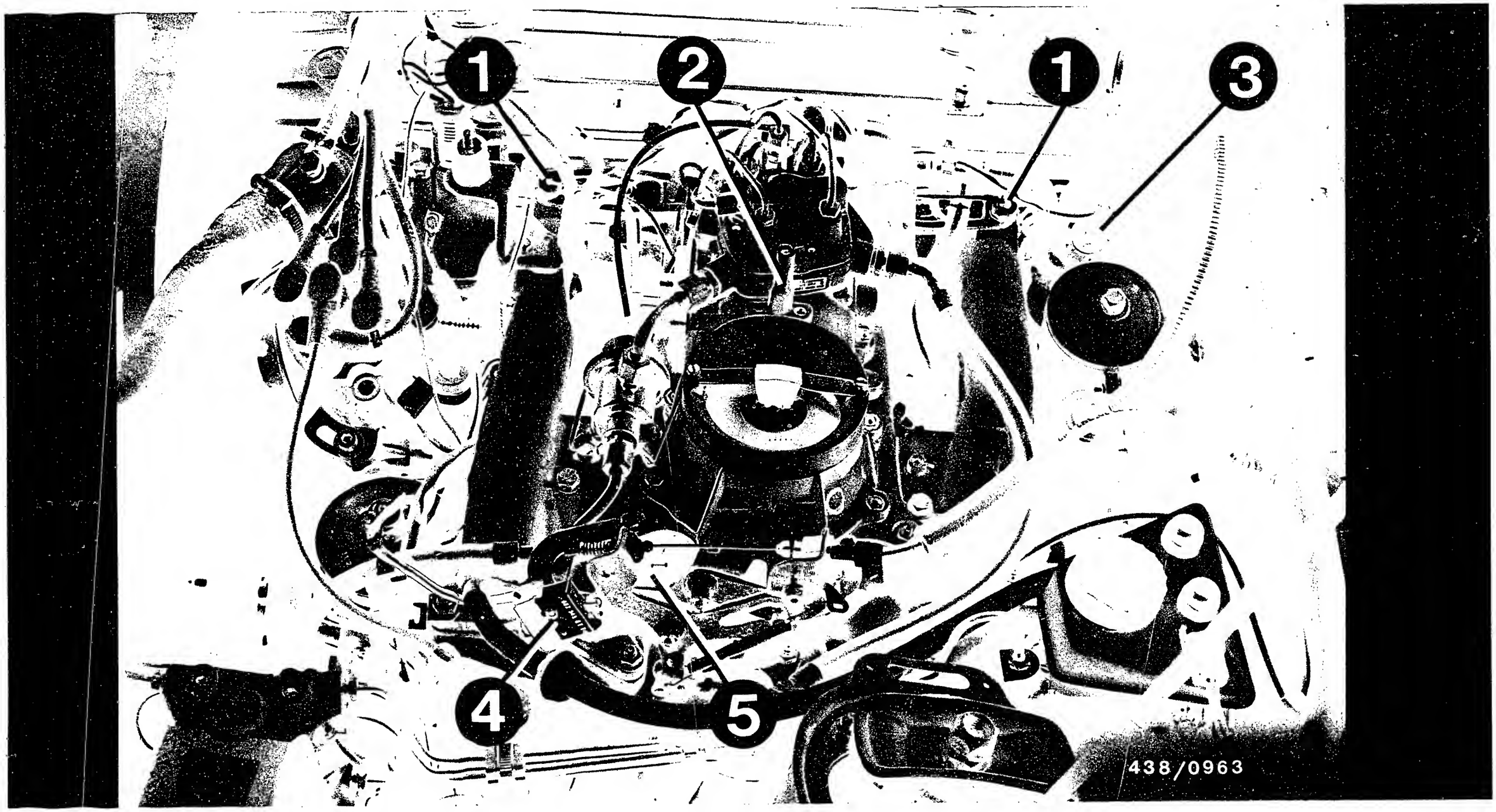
- CO analyzer (commercially available)

- Tool set for fitting and removing the CO anti-tamper device in the air-flow sensor.
  e.g. tool set no. 4521/7 from Firma Hazet, D-5630 Remscheid.



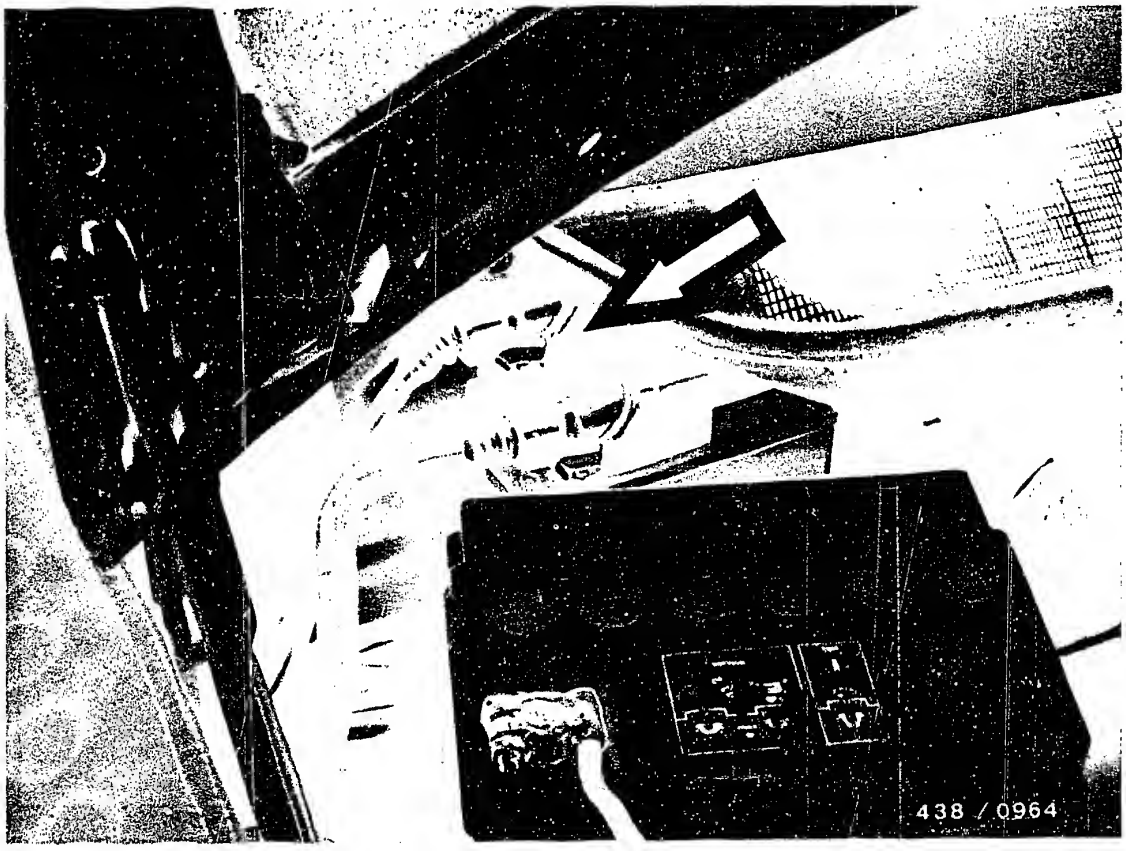
7. Installation position of individual components

1 = Start valve
2 = Electrohydraulic pressure controller
3 = Complete mixture-control unit
4 = Thermo-time switch
5 = Temperature sensor (NTC)
6 = Air-flow sensor potentiometer
7 = Pressure regulator (primary pressur

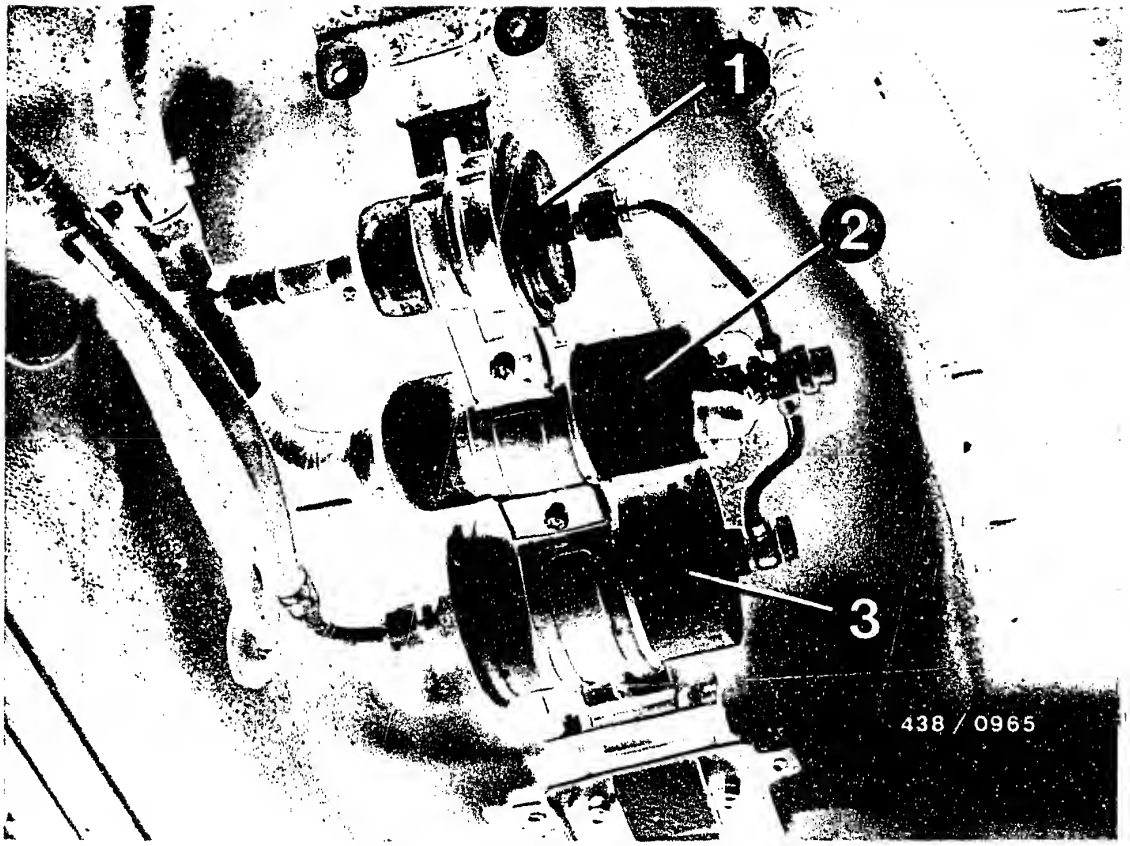


Installation position of individual components (continued)

1 = Injection valves of cylinders 1 and 4
2 = Idle-mixture-adjusting screw setting device
3 = Auxiliary-air device
4 = Throttle-valve switch - idle
5 = Throttle-valve switch - full load



The electronic control unit (arrow) is in the protected equipment compartment, on the right-hand side in the forward direction of travel behind the battery and the ABS controller.



1 = Fuel accummulator
2 = Electric fuel pump
3 = Fuel filter

The fuel-supply components are mounted on a common mounting piece underneath the floor of the vehicle, on the left-hand side as viewed in the forward direction of travel in the region below the driver's seat.

8. Trouble-shooting chart for KE-Jetronic

Important information on the following trouble-shooting chart:

The KE-Jetronic differs in important areas from other known injection systems with regard to its operation.

This calls for a specific structure of the trouble-shooting chart and of the sequence of the invididual test steps.

The following trouble-shooting program begins with a trouble-shooting chart (C3...C6) in which reference is made to the possible causes of the trouble in accordance with the fault symptom (customer complaint).

In each cause column reference is made to the first coordinate of the section in which the testing of this function is described in detail.

The trouble-shooting program has been structured in such a way that direct trouble-shooting is possible whereby the fault must always be determined in accordance with the trouble-shooting chart (C3...C6).

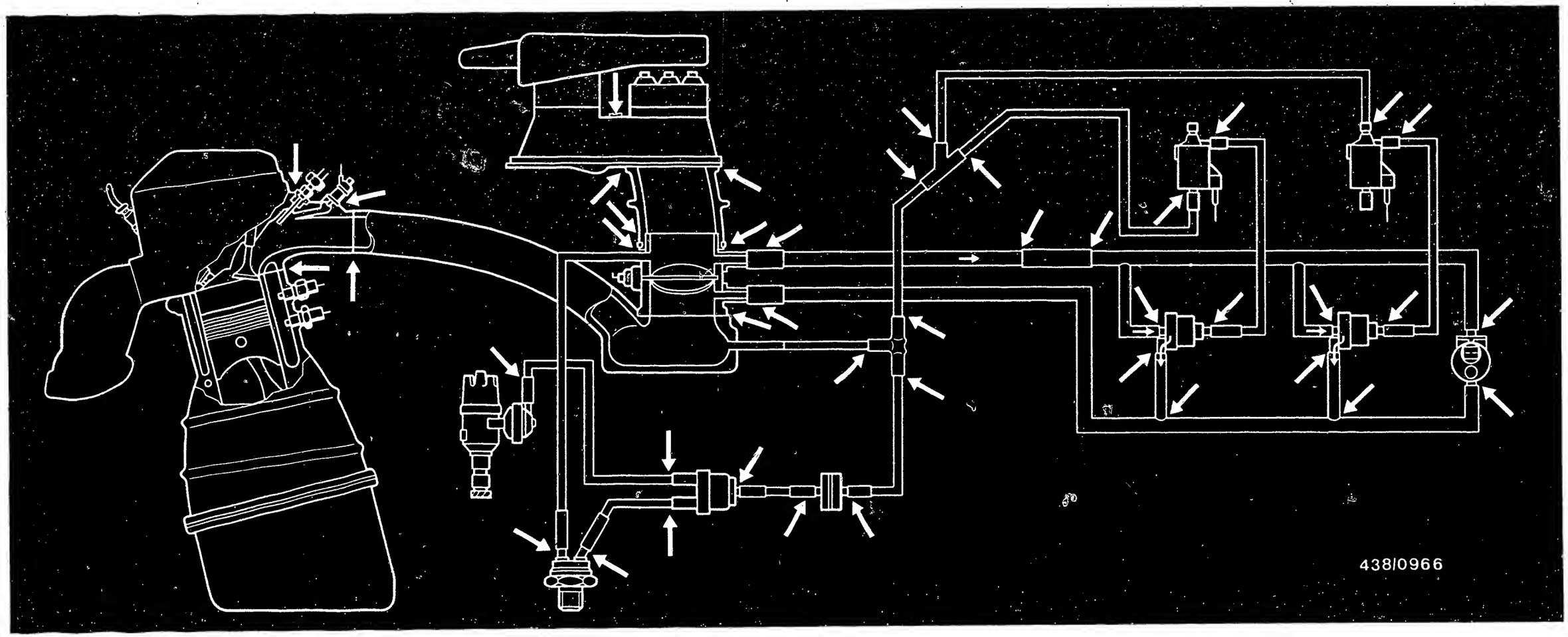
Trouble-shooting chart

Customer complaint (fault symptom)

1. Engine fails to start or starts only with difficulty when cold	2. Engine fails to start or starts only with difficulty when warm (hot-starting difficulties)	3. Uneven idle during warm-up phase (shakes)	4. Uneven idle with engine warm (shakes)	5. Poor throttle take-up, burbling	6. Engine missing during vehicle operation, high load	7. Unsatisfactory performance	Cause (component fault)	Coordinates
●	●				●	●	Electric fuel pump not operating	D 1
	●	●	●	●			Air-intake system of engine leaking	C 7
●	●	●	●	●			Air-flow sensor control lever/control plunger stiff	C 9
●	●						Position of air-flow sensor plate incorrect	C 15
		●					Auxiliary-air device not opening or closing	C 21
●							Cold-start system defective	D 3
		●	●				Start valve leaking	D 3
●	●				●	●	Primary pressure outside tolerance	D 7
●	●	●	●		●	●	Differential pressure outside tolerance	D 11
	●						Overall fuel system leaking	D 21
	●	●	●				Injection valves leaking, opening pressure too low	E 7
		●	●		●	●	Imbalance of fuel delivery (dispersion of deliveries)	E 15
	●	●	●				Idle adjustment incorrect	G 9
						●	Throttle valve not opening fully	----
●	●	●		●	●	●	Incorrect correction function (following code)	F 4
●	●						"Starting enrichment" function outside tolerance	F 23
							"Post-start enrichment" function outside tolerance	F 23
●		●					"Warm-up enrichment" function outside tolerance	F 21
				●			"Acceleration enrichment" function outside tolerance	G 1
					●	●	"Full-load enrichment" function outside tolerance	G 3
			●	●			"Idle" throttle-valve switch incorrectly adjusted	F 11

Customer complaint (fault symptom)

8. Engine runs on ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration at idle too high	12. CO concentration at idle too low	13. Idle speed not adjustable (too high)	14. Engine starts but then immediately dies	Cause (component fault)	Coordinates
							Electric fuel pump not operating	D 1
		●		●			Air-intake system of engine leaking	C 7
●		●	●	●			Air-flow sensor control lever/control plunger stiff	C 9
●							Position of air-flow sensor plate incorrect	C 15
					●		Auxiliary-air device not opening or closing	C 21
●			●			●	Control plunger seal (free travel of air-flow sensor plate) incorrectly adjusted	C 17
●	●		●				Start valve leaking	D 3
							Primary pressure outside tolerance	D 7
	●	●	●	●		●	Differential pressure outside tolerance	D 11
							Overall fuel system leaking	D 21
●							Injection valves leaking, opening pressure too low	E 7
	●	●		●		●	Imbalance of fuel delivery (dispersion of deliveries)	E 15
		●	●	●			Idle adjustment incorrect	G 9
		●	●			●	Incorrect correction function	F 4
							"Starting enrichment" function outside tolerance	F 23
						●	"Post-start enrichment" function outside tolerance	D 23
			●			●	"Warm-up enrichment" function outside tolerance	F 21
		●					"Acceleration enrichment" function outside tolerance	G 1
		●					"Full-load enrichment" function outside tolerance	G 3
						●	"Idle" throttle-valve switch incorrectly adjusted	F 11



9. Check the vacuum system of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).
Under no circumstances may combustible liquids be used when testing for leaks.

The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature: Idle-speed adjustment is described on Coordinates G7.

10. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

Note: THe air-flow sensor plate must be flat (not bent) and must be able to pass through the narrowest point of the air funnel without touching.

10.1 Preparations:

- Engine temperature not below +20°C.
- Remove the air filter so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for a few seconds by bridging the electrical safety circuit so that pressure is applied to the control plunger. Connect pins 7 and 8 in the relay base with an auxiliary cable in order to bridge the safety circuit.

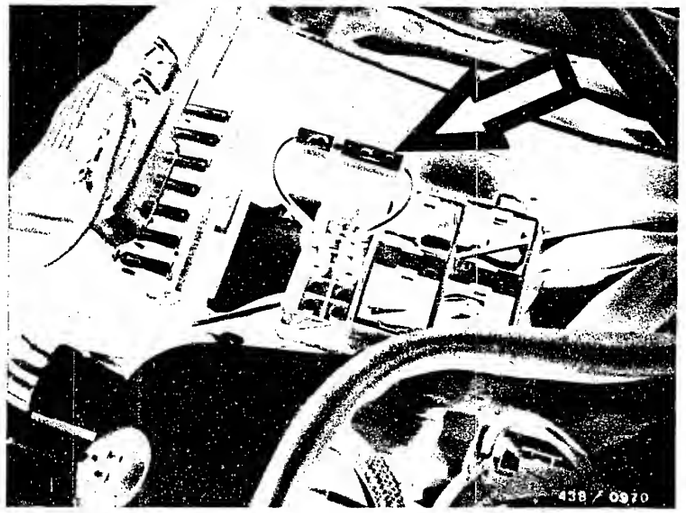
10.2 Check that the control lever moves freely:

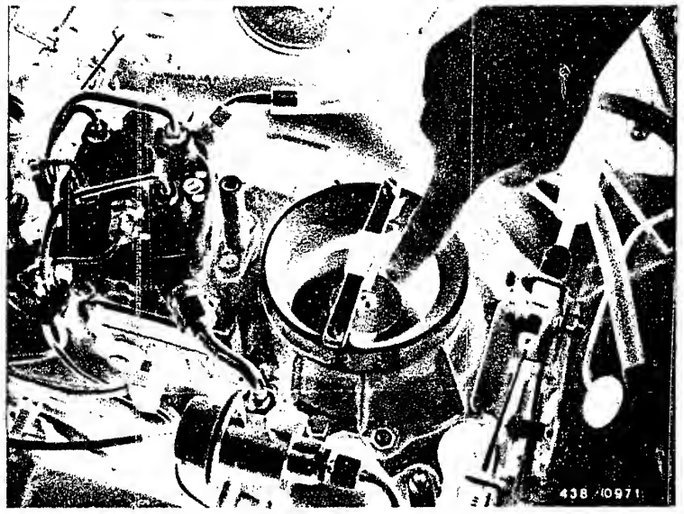
Depress the air-flow sensor plate by hand and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever is stiff, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem. If, with the fastening screws loosened, the stiffness has disappeared, change the gasket between the air-guide housing and the air-flow sensor (Daimler-Benz service part). Since this requires removing the air-flow sensor, clean all fuel connections on the fuel distributor and unscrew.

Caution: When installing the air-flow sensor, do not apply any sealing compound between the sealing surfaces.
Tightening torque for air-flow sensor fastening screws: 9...10 Nm.

If housing deformation is not the cause of the stiffness, replace the air-flow sensor.

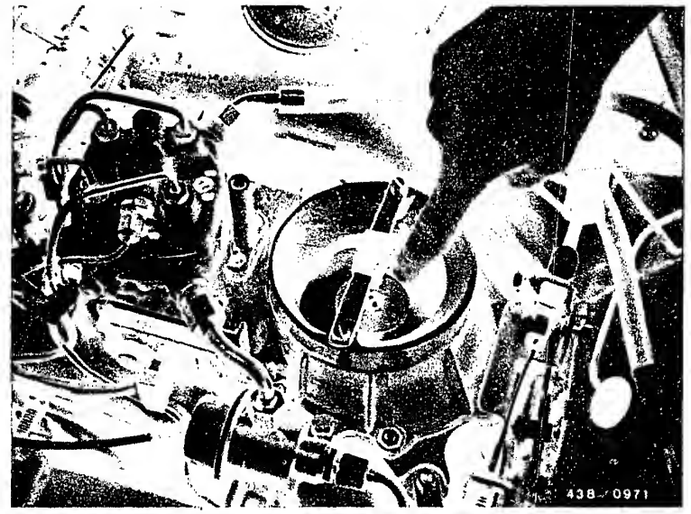
Note: Repairing the control-lever mounting is not possible in the case of the KE-Jetronic air-flow sensor.





10.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand. The same resistance must be felt over the entire movement.
Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially looses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor. Thoroughly clean the fuel distributor in the region of the fuel connections. Unscrew all connections. When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component. Unscrew three fastening screws and remove the fuel distributor from the air-flow sensor.



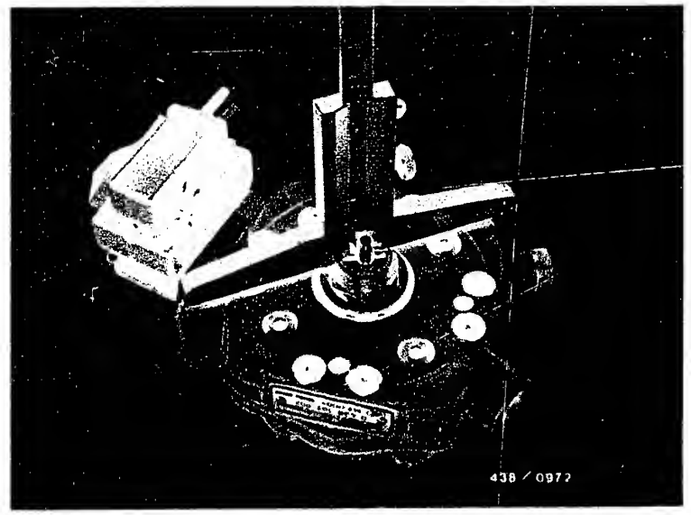
Using a depth gauge, measure the position of the slotted round nut of the lower plunger seal in relation to the fastening nut of the barrel with metering slits, and make a note for when re-installing later.

In addition, mark rotary position of slotted round nut by marking.
Unscrew slotted round nut with pin screwdriver and remove control plunger.

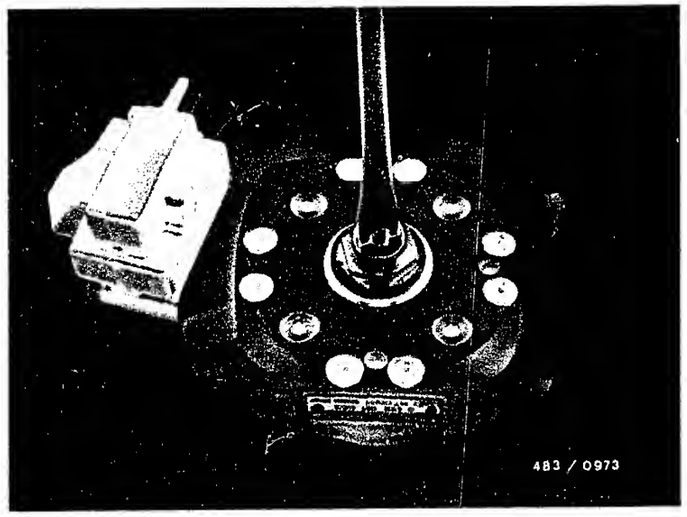
Caution: Do not loose the spring above the control plunger.

Clean the plunger thoroughly in benzine or similar. If the plunger is heavily scored or if it cannot be made to move freely by cleaning, replace the complete fuel distributor. Mechanical cleaning of the control plunger is impermissible.

After installing spring and plunger in fuel distributor, screw in slotted round nut of lower plunger seal as far as the position found when removing, and turn to the mark.



Re-mount the fuel distributor on the air-flow sensor. Insert a new seal ring between air-flow sensor and fuel distributor. Tightening torque for fuel distributor fastening screws: 3.2...3.8 Nm; observe precisely.



10.4 Additional information on mechanical adjustment of mixture-control unit:

Due to the lower control plunger seal in the KE fuel distributor, if the overall adjustment of the mixture-control unit is correct the control plunger must not rest on the needle bearing of the air-flow sensor plate intermediate lever.
The air-flow sensor plate control lever must cover a free travel between zero position (rest position of sensor plate) and contact with the control plunger. This free travel should be in the center of the sensor plate and, with the electric fuel pump operating, should be 1 ... 2 mm.

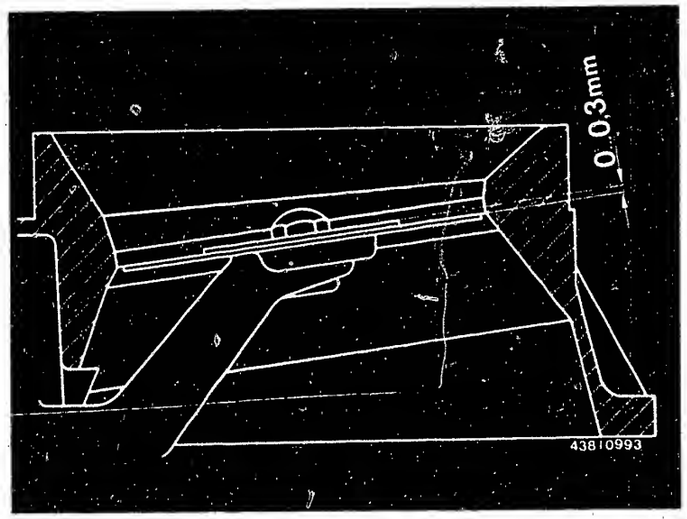
Correct overall adjustment of the mixture-control unit means:

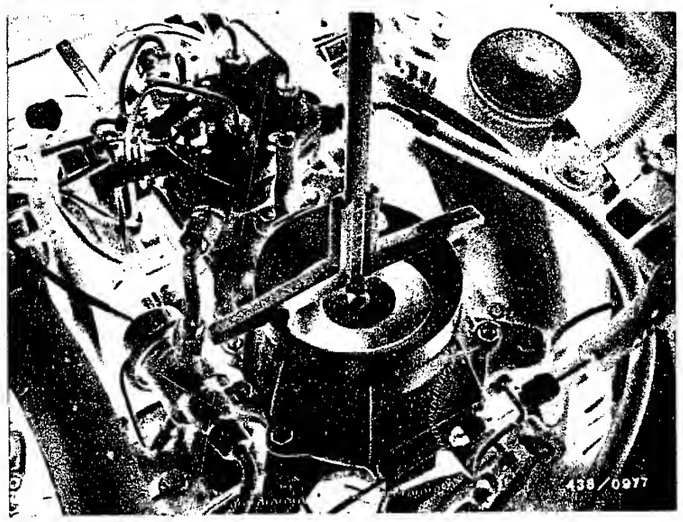
+ Zero position of sensor plate correctly adjusted.
  Test the zero position as follows:
  Remove stop bracket from air funnel.
  Fix air-flow sensor plate in basic position with depth gauge and measure dimension from top edge of relief funnel.
  Basic position (picture): Top edge of sensor plate flush with bottom edge of transition from cylindrical area into air funnel (visual examination).
  Then measure difference as far as zero position of sensor plate.
  It must be 4.2 ... 4.4 mm.
+ Idle adjustment of engine O.K. (Coordinate G9).
  Test specifications and settings:
  CO concentration = 0.5 ... 1.5 % by vol.
  Idle speed = 750 ... 850 min^{-1}

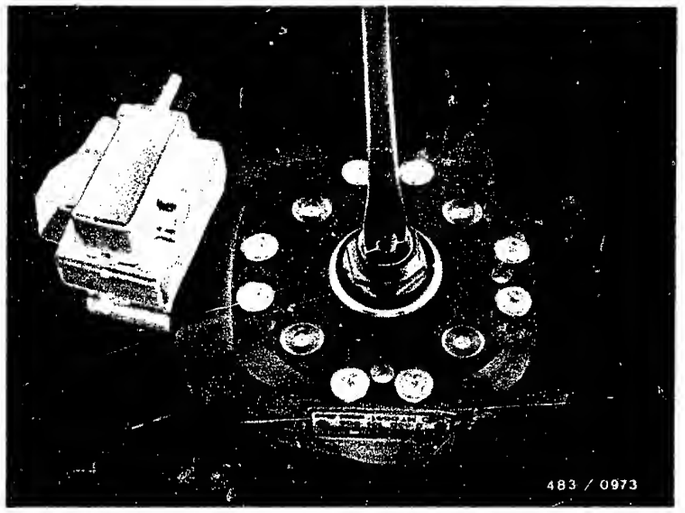
If, despite correct zero position of sensor plate and despite correct idle adjustment, the required free travel is outside the value 1 ... 2 mm, remove the fuel distributor once again and appropriately correct the slotted round nut of the lower plunger seal and thus the position of the plunger.

Note:
Screwing in the slotted round nut by 0.1 mm increases the free travel in the center of the sensor plate by approx. 0.7 mm and vice versa.

Finally, check the idle adjustment once again, and correct if necessary. (Coordinate G 9).







11. Centering the air-flow sensor plate and zero position of the sensor plate

11.1 Centering the air-flow sensor plate

The air-flow sensor plate must be flat (not bent) and must be able to pass trough the narrowest point of the air funnel without touching.

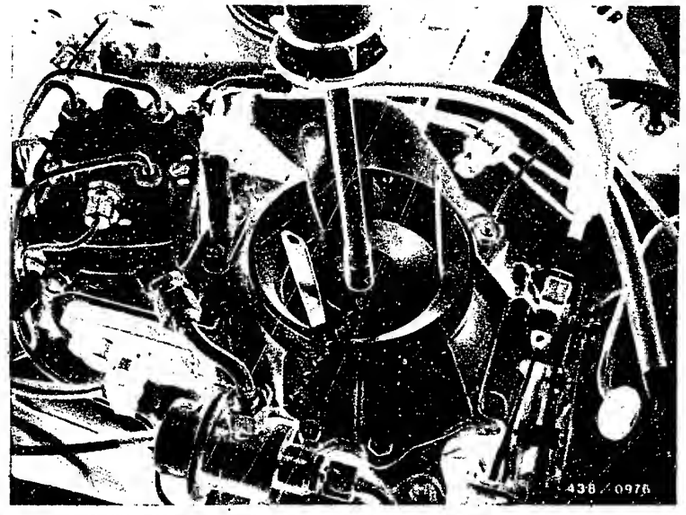
If necessary, center the air-flow sensor plate.
To do this, remove stop bracket.
Loosen sensor plate fastening screw and tighten again with 2 or 3 0.05 mm feeler gauges inserted in position.
Tightening torque: 5 ... 5.5 Nm
Important note on sensor plate fastening screw:

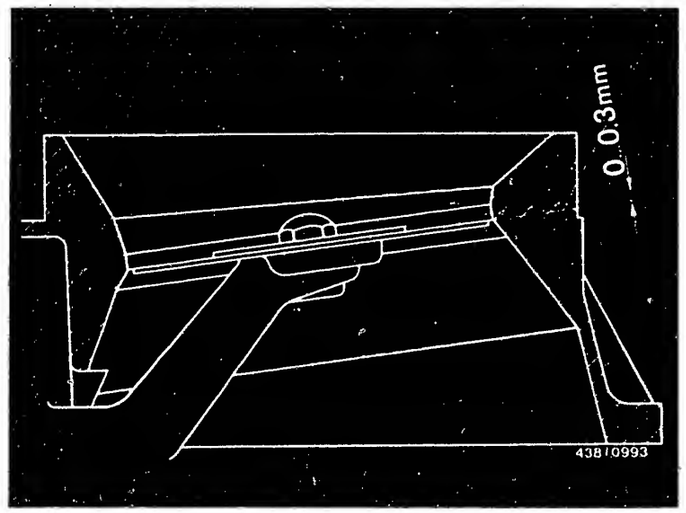
To lock the screw, it was micro-encapsulated at the factory and is, therefore, difficult to loosen and turn. Screws which are very stiff should not be freed by force, but should be heated slightly with a soldering iron.

NO NAKED FLAME!

If, after being loosened several times, the screw turns very easily, unscrew, clean and coat with a little screw-locking compound (e.g. Loctite). Coat only a few turns of the thread so that the screw can be loosened again later.

After the screw has been tightened to the specified tightening torque, it must no longer be possible to turn the air-flow sensor plate by hand.





11.2 Zero position of air-flow sensor plate

The starting point for determining the zero position of the air-flow sensor plate is the basic position of the sensor plate.

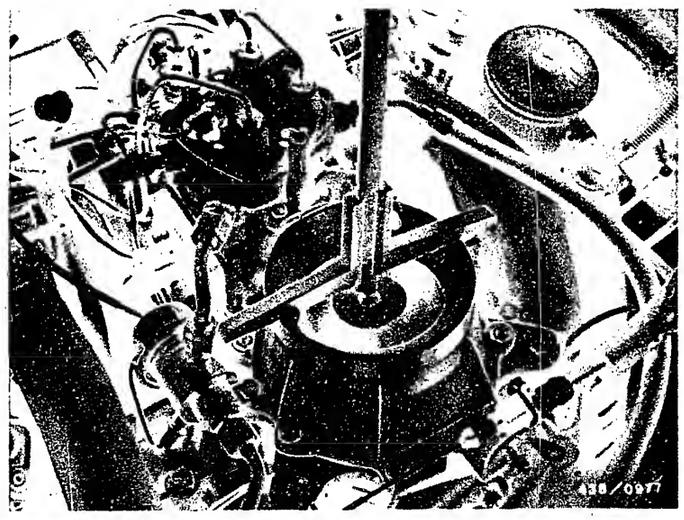
Definition of basic position:

Top edge of sensor plate flush with bottom edge of cylindrical section of air funnel.
Maximum upward deviation: 0.3 mm. Visual assessment on outside of air funnel.

Definition of zero position (spring-loaded stop):

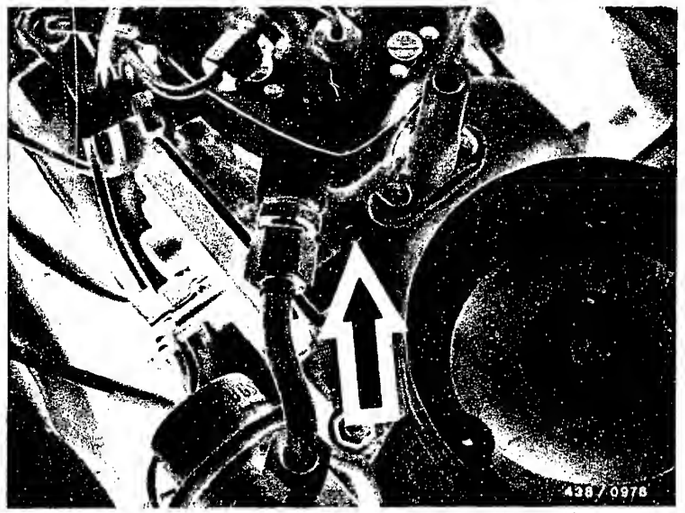
Sensor plate position 4.2 ... 4.4 mm higher than basic position, measured at centre of sensor plate.

Fix basic position with depth gauge in center of sensor plate from top edge of relief funnel and measure dimension.
Then measure difference as far as zero position.
It must be within 4.2 ... 4.4 mm.



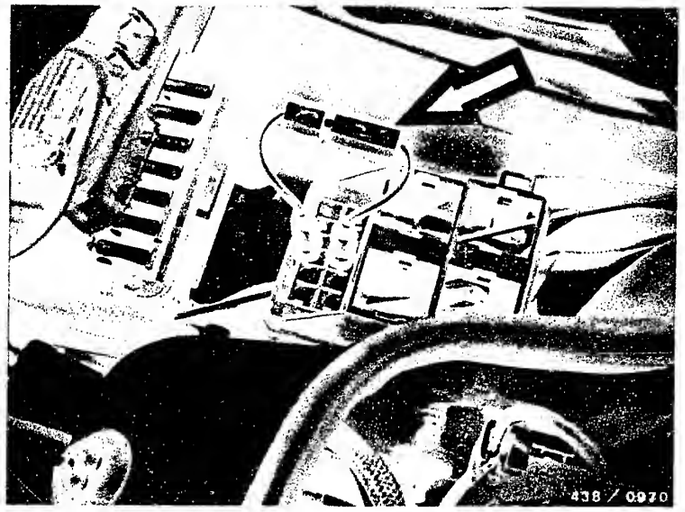
If the position of the air-flow sensor plate is too high it is possible to make an adjustment. To do this, drive in the guide pin (arrow) of the stop leaf spring the appropriate amount using a mandrel and a light hammer.

Caution:
Perform the adjustment very carefully so that the guide pin is not driven too far. Under all circumstances, avoid repeating the adjustment in both directions since the force fit of the pin will become insufficient. If the pin drops out, this can lead to serious engine damage.



11.3 Adjusting the lower plunger seal in the fuel distributor:

Switch on the electric fuel pump for a few seconds by bridging the electrical safety circuit so that pressure is applied to the control plunger. To do this, connect pins 7 and 8 in the relay base using auxiliary cable.



If the zero position of the sensor plate is correctly set, the control plunger must not rest on the needle bearing in the sensor plate intermediate lever.
To check, press the air-flow sensor plate lightly downward.
The air-flow sensor plate lever must cover a free travel between zero position and point of contact with control plunger.
This free travel should be 1 ... 2 mm.

To adjust, remove the fuel distributor and screw in or screw out the slotted round nut of the plunger seal as required.
Changing the screw-in depth by 0.1 mm yields approx. 0.7 mm in the center of the sensor plate.

Special case:

If the slotted round nut of the plunger seal and the idle-mixture-adjusting screw in the air-flow sensor are both out of adjustment by an unknown amount, the free travel may possibly be entirely non-existent or may be much too great. In such a case, proceed as follows:

Remove fuel distributor and turn back slotted round nut, flush with the collar of the hexagon nut.

On the air-flow sensor, using a depth gauge, measure the dimension between fuel-distributor support surface (eyes of thread) and needle bearing in control lever, and adjust to 21.2 mm by adjusting the idle-mixture-adjusting screw. Mount the fuel distributor; there is now no free travel.

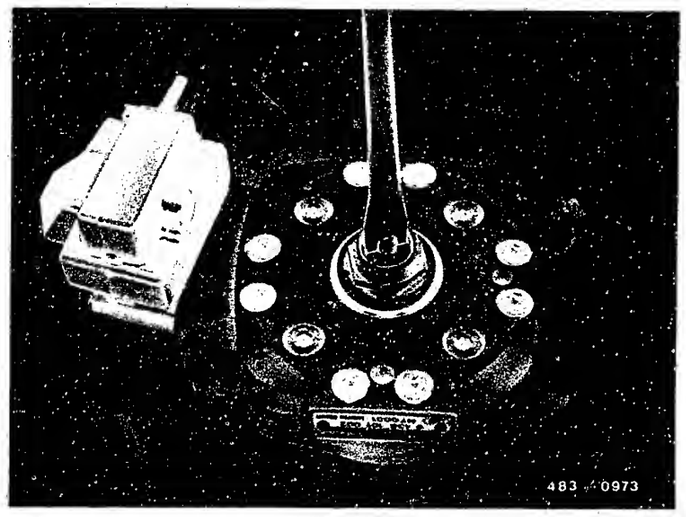
Warm up the engine and make the idle adjustment (Coordinate G 9).

Remove the fuel distributor again and screw in the slotted round nut approx. 0.6 mm deeper. Mount fuel distributor, and connect only fuel inlet, both returns and start valve line.

With the electric fuel pump running, test the free travel, possibly adjusting the slotted round nut once again with the fuel distributor removed.

Note: Changing the screw-in depth of the slotted round nut by 0.1 mm yields approx. 0.7 mm in the center of the sensor plate.

Finally, connect all lines to the fuel distributor. Check the idle adjustment again and correct if necessary (Coordinate G9).

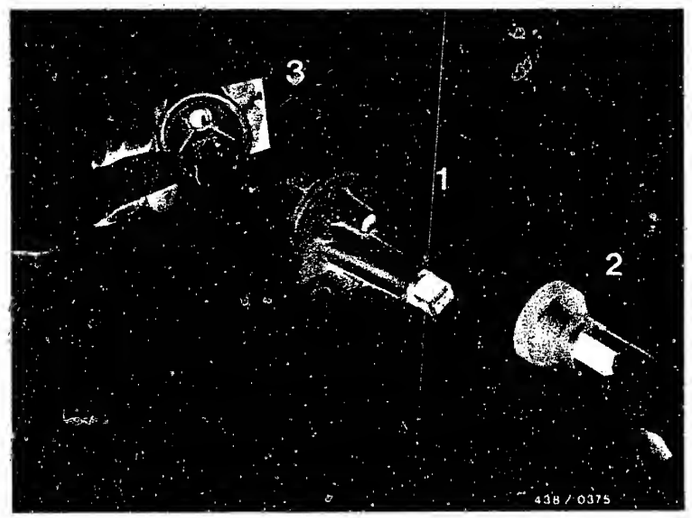


12. Checking the operation of the auxiliary-air device

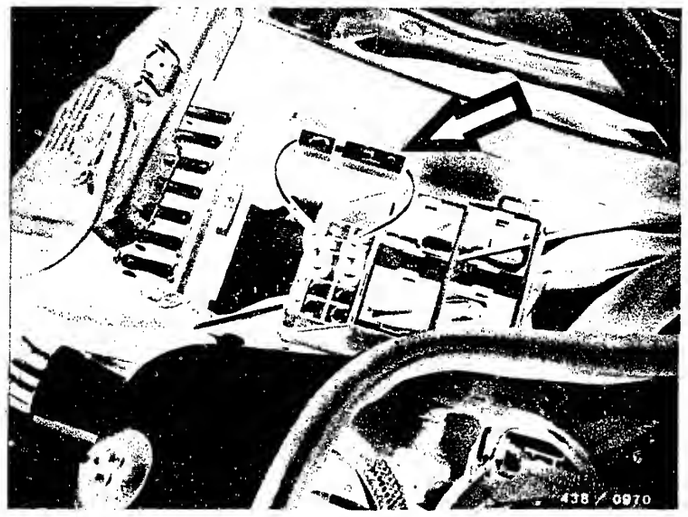
The engine must be cold.
Disconnect plug from auxiliary-air device.
Disconnect both air hoses from the auxiliary-air device.
Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.
- Fit the electric cable plug on the auxiliary-air device.
- By bridging the electrical safety circuit, supply power to the auxiliary-air device. To do so, bridge relay-socket terminals 7 & 8 with a jumper lead. After a max. of 10 mins, the opening in the auxiliary air device must be fully closed by blocking plate.
- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.
- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohm-meter. Nominal resistance value 30 ... 65 Ω.
- Replace the auxiliary-air device if defective.

When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates G7.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

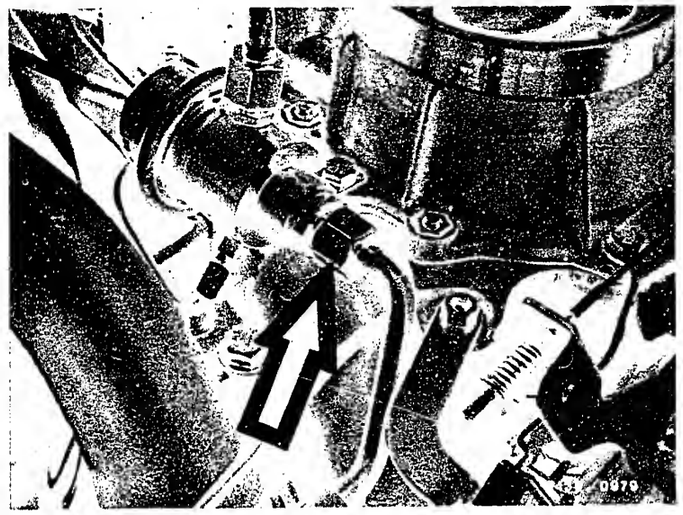


13. Checking the operation of the electric fuel pump

13.1 Measuring point

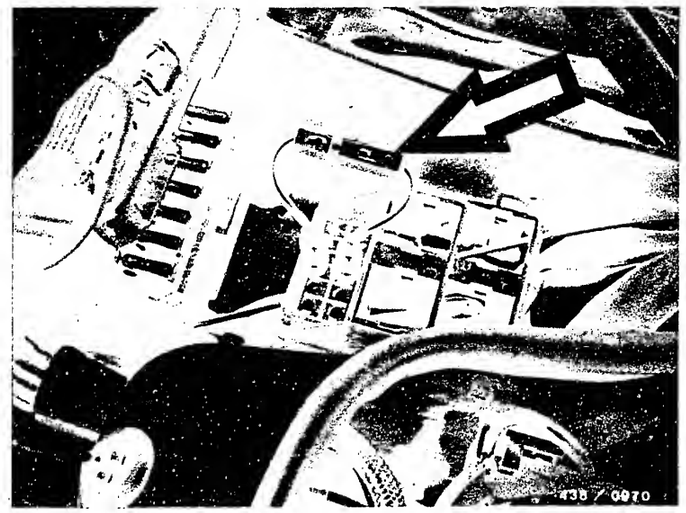
Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return connection of the pressure regulator (top picture - arrow).

Unscrew the fuel return line from the pressure regulator, applying counter-force to the fixed hexagon of the pressure regulator. Connect hose line with ball connector M 14 x 1.5 to the return connection of the pressure regulator. Hold the hose line in a graduate for testing.



13.2 Testing

Switch on the electric fuel pump for precisely 1 minute by bridging the electrical safety circuit and measure the fuel delivery in the graduate.
Bridge the safety circuit by connecting pins 7 and 8 in the relay base using a connecting cable.



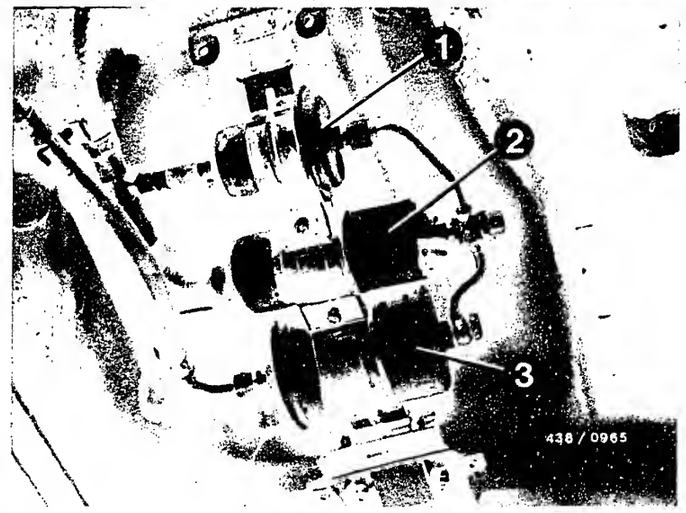
13.3 Test specification for fuel delivery measurement

Minimum delivery: 1100 cm^3/min

13.4 Possible causes of insufficient fuel delivery

- Power supply to the electric fuel pump defective, voltage drop. Necessary minimum voltage across the terminals with electric fuel pump operating: 11.5 V.
- Fuel filter very dirty.
- Strainer in double fitting of fuel distributor inlet clogged.

If these items are in proper condition, the cause lies with the electric fuel pump itself. Replace electric fuel pump.



13.5 Removing and installing the electric fuel pump

Pinch off the fuel intake hose (e.g. using hose clamper W 157 from Matra Co.) and remove the intake hose from the electric fuel pump (2). Catch any escaping fuel. Unscrew the common delivery line from fuel filter (3), electric fuel pump and fuel accumulator (1). Apply counter-force at the fixed hexagon of the components. Replace electric fuel pump and connect in reverse order. Always connect the delivery lines with new seal rings.

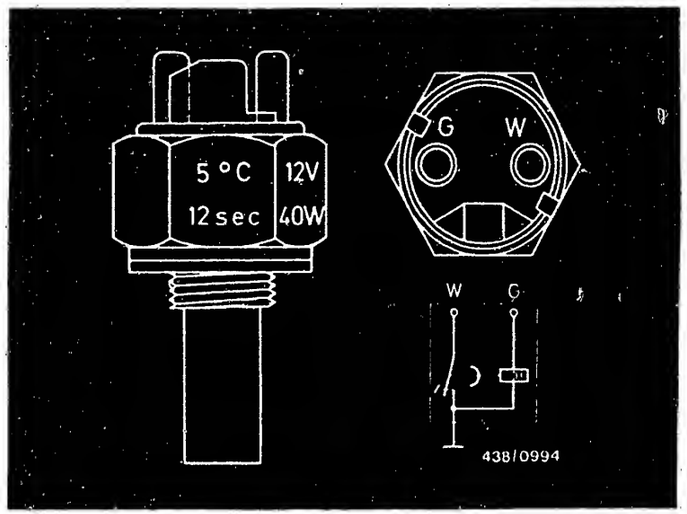
14. Checking the cold-start system (thermo-time switch/start valve)

14.1 Thermo-time switch

Remove the thermo-time switch (top picture - arrow) for testing. If possible, remove only with the engine cold since a little coolant escapes. The amount escaping if the engine were warm would be considerably greater.

The switching temperature at +5°C and the switching time at -20°C of 12 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. Cooling to below 0°C takes place in a freezer chest.

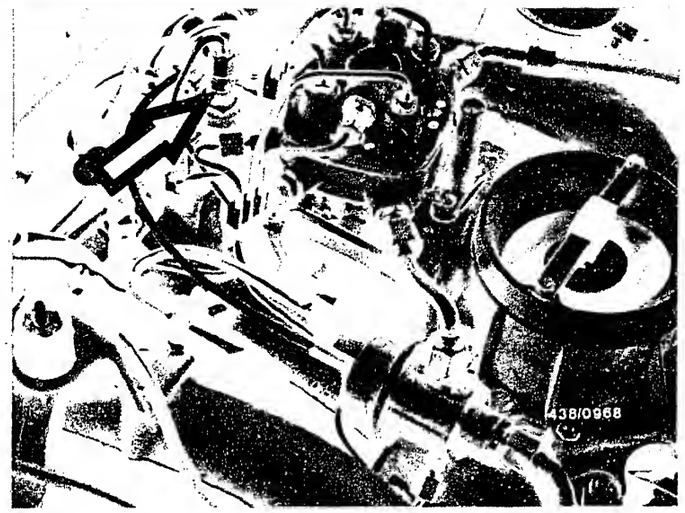
At temperature below °C	above °C	Resistance measurement between Term. "G" and ground (housing)	Term. "W" and ground (housing)	Term. "G" and "W"
0		75...110 Ω	0 Ω	75...110 Ω
	+ 10	75...110 Ω,	∞Ω	∞Ω



14.2 Start valve

Remove the start valve (bottom picture - arrow) for testing. To loosen the fuel line, apply counter-force at the hexagon of the threaded double fitting.

Likewise unscrew the fuel line to the start valve on the fuel distributor (central connection).



Connect the start valve directly to the start valve connection of the fuel distributor using the hose line from the connecting-parts set KDJE-P 100/11 and threaded double fitting M8 x 1/M 12 x 1.5. Hold the start valve in a graduate for testing.

Connect the start valve directly to ground and terminal 15 using the connecting cable KDJE 7450/70 (pin 9 in relay base of electrical safety circuit).

Caution:
Do not connect start valve directly to B+.
Danger of fire through sparking.

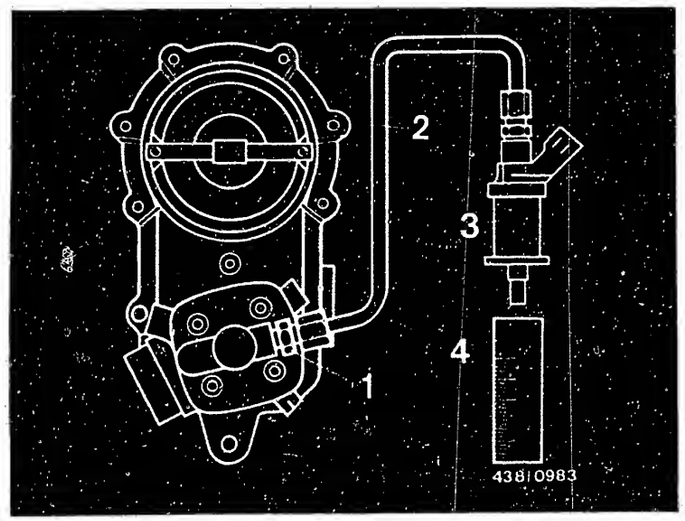
Testing:

Switch on the electric fuel pump by bridging the electrical safety circuit. To do this, connect pins 7 and 8 with auxiliary cable (bottom picture - arrow).
Hold the start valve in a graduate and switch on the ignition. The start valve must squirt finely atomized fuel in a uniformly conical spray.

Switch the ignition off again and dry off the nozzle of the start valve. Remove the connecting cable.

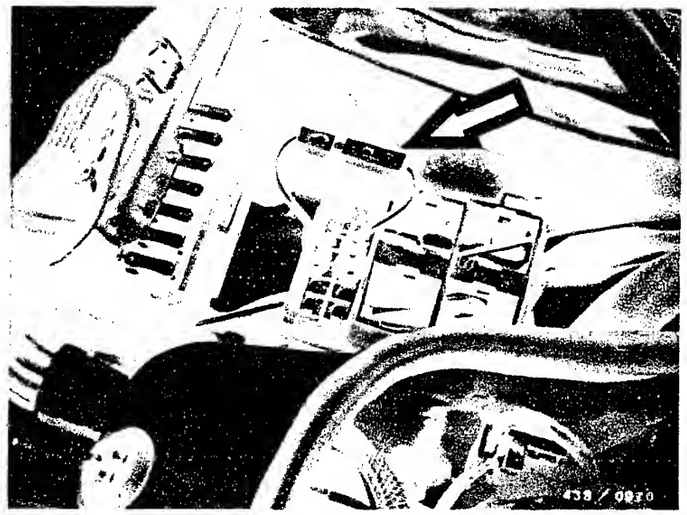
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.

Then switch the electric fuel pump off again. Replace the start valve if it does not open or if it leaks.



1 = Threaded double fitting M 8x1/M 12x1.5
2 = Hose line from KDJE - P 100/11
3 = Start valve
4 = Graduate

When the thermo-time switch or the start valve has been replaced, it is then necessary to check the idle adjustment and to correct it if necessary, see Coordinate G 9.



15. Pressure measurements

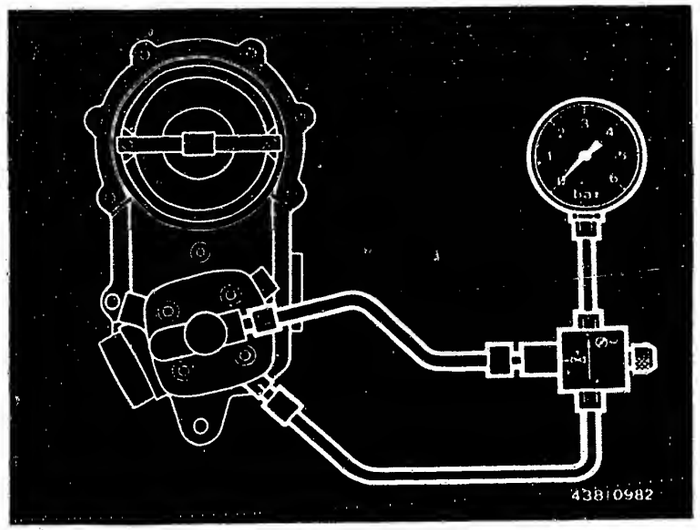
15.1 Primary pressure

Fitting the pressure tester KDJE-P 100

Fit using connecting-parts set KDJE - P 100/10 and .../11.
Important:
There is a special measuring bore on the bottom part of the housing of the fuel distributor for connecting the pressure tester. During operation, this bore is closed with a screw. (Picture - bottom arrow). Before opening the screw plug, the remaining pressure in the primary-pressure circuit must be removed. To do this, always first of all loosen the connection for the start valve (central connection on fuel distributor) (picture - top arrow).

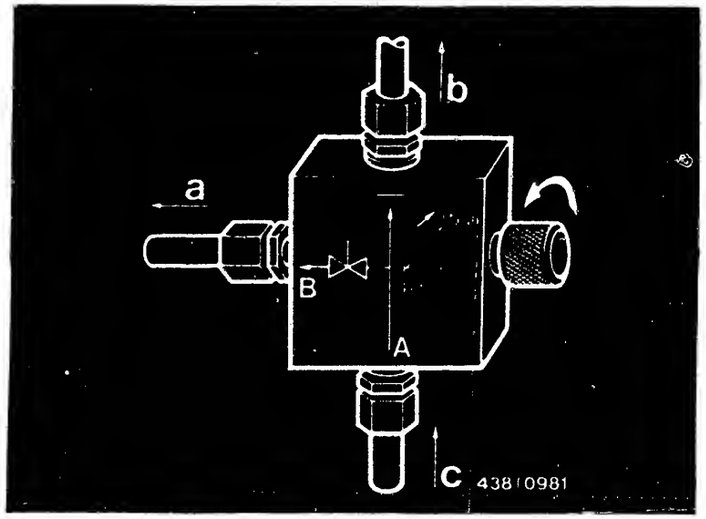
Using the threaded double fitting M 8 x 1/M 12 x 1.5 from KDJE - P 100/10, connection "A" of the directional-control valve is connected to the measuring bore in the fuel distributor.

Using the hose line from KDJE - P 100/11, connection "B" is connected to the connection for the start valve on the fuel distributor.



Testing the primary pressure:

Open the hollow screw of the directional-control valve (turn in a counterclockwise direction).



Switch on the electric fuel pump by bridging the electrical safety circuit. To do this, bridge pins 7 and 8 in the relay base using a connecting cable.

Pressure gauge of pressure tester indicates primary pressure.

Test specification for primary pressure: 5.25 ... 5.6 bar gauge pressure

Possible causes of primary pressure being too low:

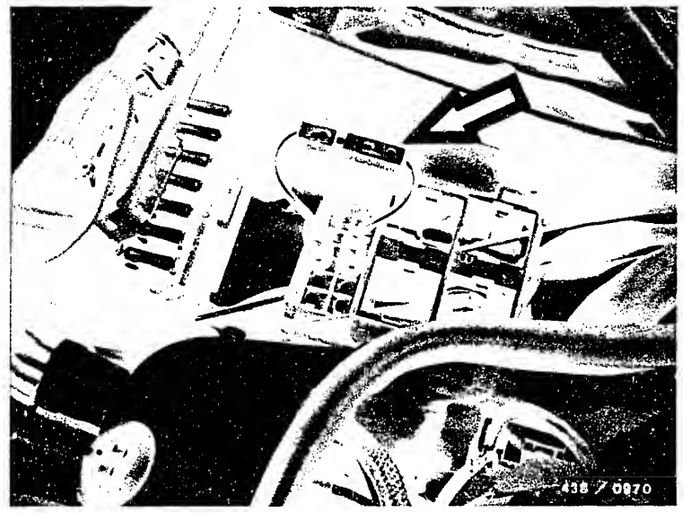
- Fuel supply not in order. Fuel delivery of electric fuel pump too low.
  Measure delivery at return connection of pressure regulator.
  Test specification: min. 1100 cm^3/min.

- Primary-pressure regulator not in order.
  Replace pressure regulator.

Possible causes of primary pressure being too high:

- Fuel return to fuel tank constricted.
  For testing, lead the return from the pressure regulator into a separate container.

- Primary-pressure regulator not in order.
  Replace pressure regulator.



15.2 Testing the differential pressure

The basic function of the KE-Jetronic as well as all electronically controlled correction funtions are controlled by differential pressure. The differential pressure (difference between primary pressure and pressure in the lower chambers of the differential-pressure valves in the fuel distributor) is determined by the operation of the electrohydraulic pressure controller which is mounted on the fuel distributor.

The electrical and hydraulic operation of the pressure controller is evaluated by the following differential-pressure measurement. If the controller is operating correctly, any faults in the correction function can only stem from the energization of the pressure controller.

Since the differential pressure is measured as a function of the energization current of the pressure controller, the universal test adapter with multimeter must be connected for this measuring operation.

Fitting the pressure tester KDJE-P 100

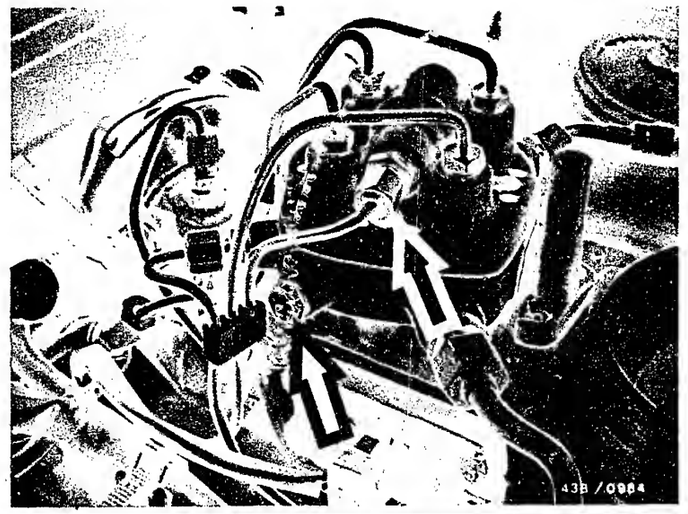
Fit using connecting parts set KDJE - P 100/10 and .../11.

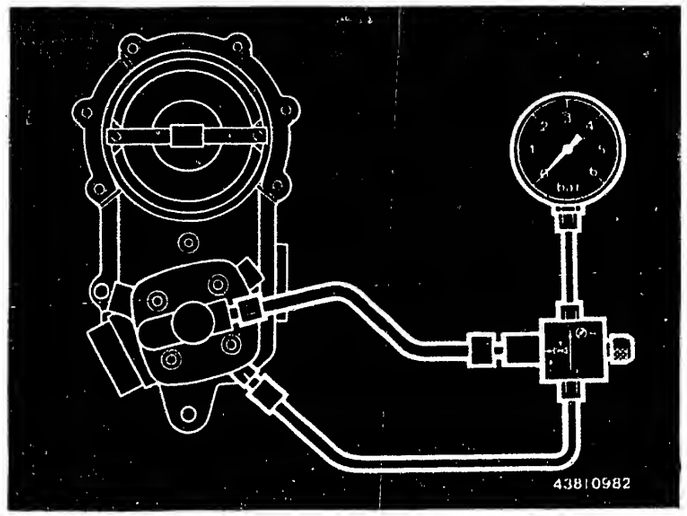
Important:

There is a special measuring bore on the bottom part of the housing of the fuel distributor for connecting the pressure tester. During operation, this bore is closed with a screw. (Picture - bottom arrow). Before opening the screw plug, the remaining pressure in the primary-pressure circuit must be removed. To do this, always first of all loosen the connection for the start valve (central connection on fuel distributor) (picture - top arrow)

Using the threaded double fitting M 8 x 1/M 12 x 1.5 from KDJE - P 100/10, connection "A" of the directional-control valve is connected to the measuring bore in the fuel distributor.

Using the hose line from KDJE- P 100/11, connection "B" is connected to the connection for the start valve on the fuel distributor.

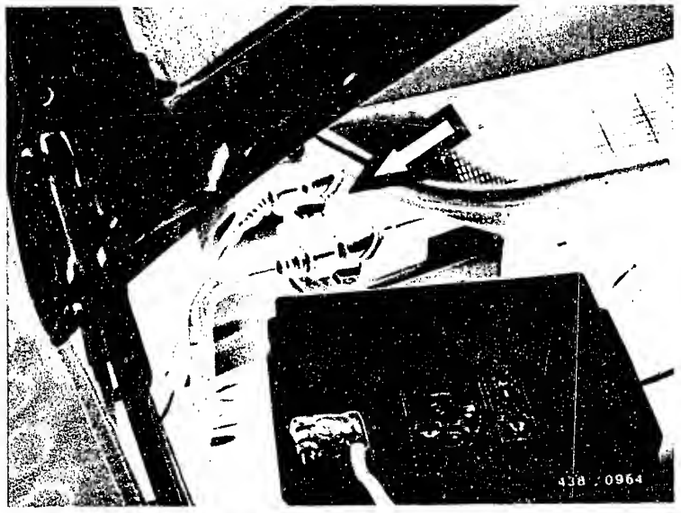




Connecting the universal test adapter

Note:
In vehicles with ABS, remove the ABS controller before removing the KE control unit.
(Release clamp and take controller out of its mounting with the multiple plug connected).

Slide the KE control unit (arrow) upward in its mounting and remove.



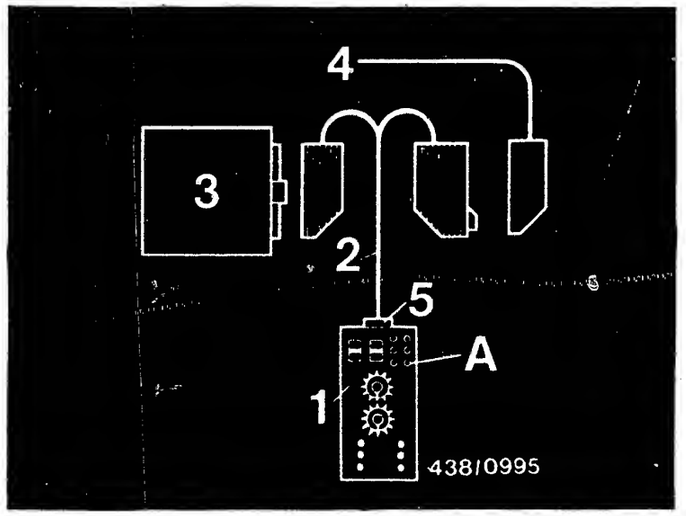
1 = Universal test adapter
2 = System adapter lead
3 = Control unit
4 = System wiring harness
5 = Pin terminal

Remove multiple plug from control unit (push back detent and first of all hinge the plug up on the side of the detent). Connect the plug to the terminal strip of the test lead of the universal test adapter.

Connect multiple plug of test lead to control unit.

Connect test lead to universal test adapter via pin terminal.

Connect ammeter (e.g. multimeter Miselco Master 50 K) in accordance with manufacturer's instructions to the black sockets (A) of the universal test adapter.



Testing

Switch on the electric fuel oump by bridging the electrical safety circuit. To do this, bridge pins 7 and 8 in the relay base.

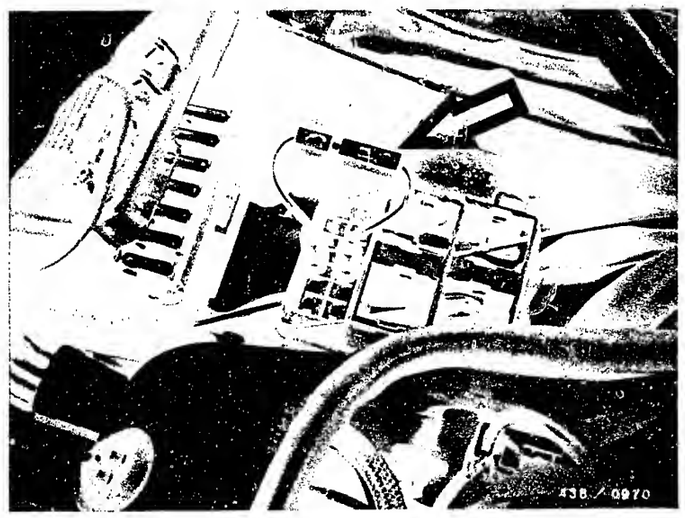
Remove the plug from the electrohydraulic pressure controller.

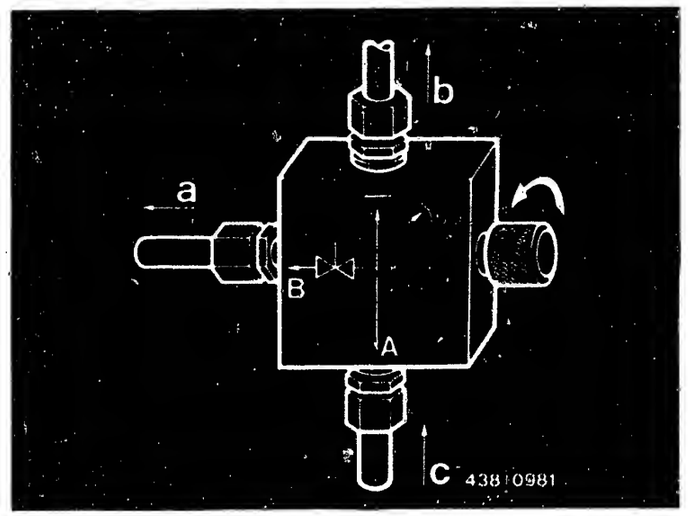
Open the hollow screw of the directional-control valve of the pressure tester (turn in a counterclockwise direction).

Pressure gauge now indicates primary pressure.

Test specification: 5.25 ... 5.6 bar gauge pressure

Make a note of the reading.





Possible causes of reading being incorrect:

- Fuel supply incorrect. Fuel delivery of electric fuel pump too low.

  Test specification: minimum delivery 1100 cm^3/min.

- Fuel return line to fuel tank constricted. For testing, unscrew return line on primary-pressure regulator and lead into a separate container.

- Primary-pressure regulator not in order. Replace pressure regulator.

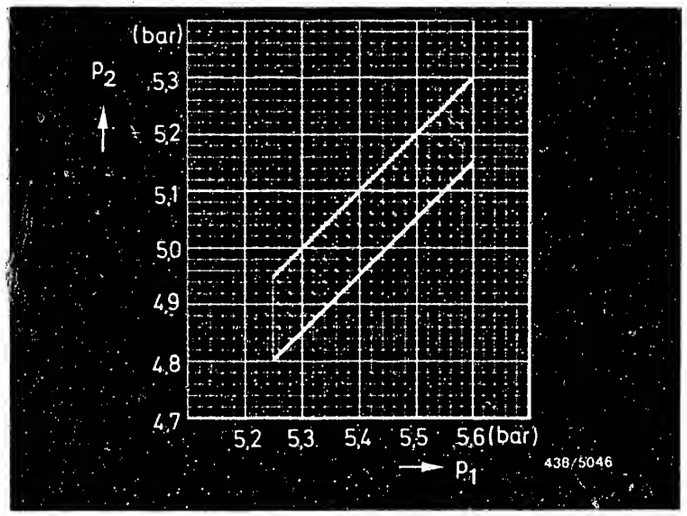
Measuring the "warm" lower-chamber pressure:

Remove the plug from the electrohydraulic pressure controller (controller current 0 mA).

Close the hollow screw of the directional-control valve (turn in a clockwise direction).

The pressure indicated on the pressure gauge must drop below the previously noted primary pressure.

Calculate the "warm" lower-chamber set-value pressure from the graph in accordance with the measured primary pressure.



P_1 = Primary pressure
P_2 = Lower-chamber pressure
Controller current = 0 mA

Possible causes of reading being incorrect:

- Fuel decoupling restriction in fuel distributor clogged. For testing, measure the overflow quantity:

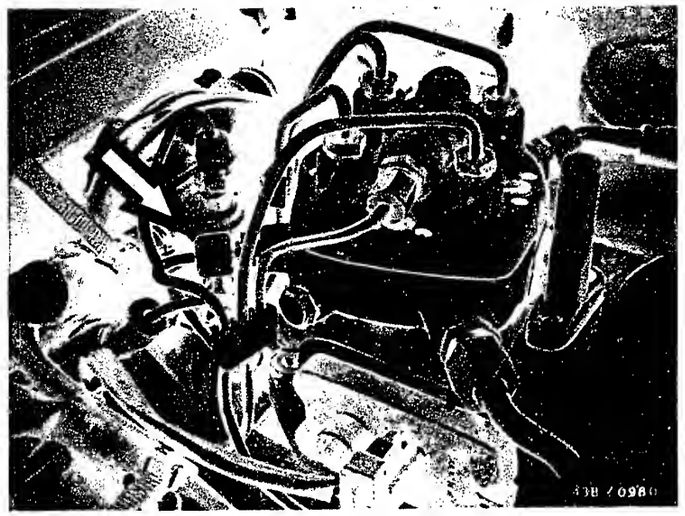
  Unscrew thin fuel line to pressure regulator on fuel distributor and seal off (bottom picture - arrow). Connect hose line with ball connector M 10 x 1 to the free connection port and measure overflow quantity.

  Test specification: 130...150 cm^3/min.

  If this value is not reached, replace the fuel distributor.

- Electrohydraulic pressure controller defective. Replace pressure controller.

  To do this, clean the fuel distributor in the region of the pressure controller. The new pressure controller is only supplied as a parts set with new seal rings and fastening screws. Always mount the pressure controller with new seal rings and the original fastening screws (non-magnetic steel).



Measuring the "cold" lower-chamber pressure:

Connect the plug to the electrohydraulic pressure controller.

Remove the plug from the temperature sensor (NTC) (arrow).

Hollow screw of directional-control valve remains closed (turned in a clockwise direction).

Set the ammeter to the 0...100 mA measuring range.

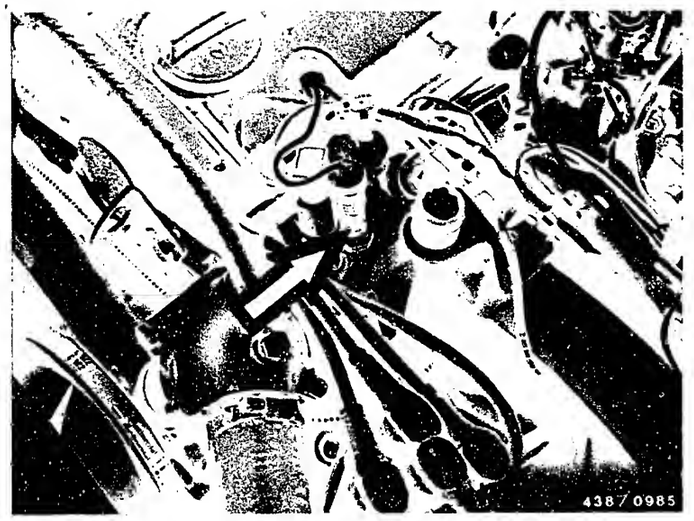
Switch on the ignition.

Calculate the required lower-chamber set-value pressure from the graph in accordance with the controller current now indicated by the ammeter and in accordance with the previously measured primary pressure.

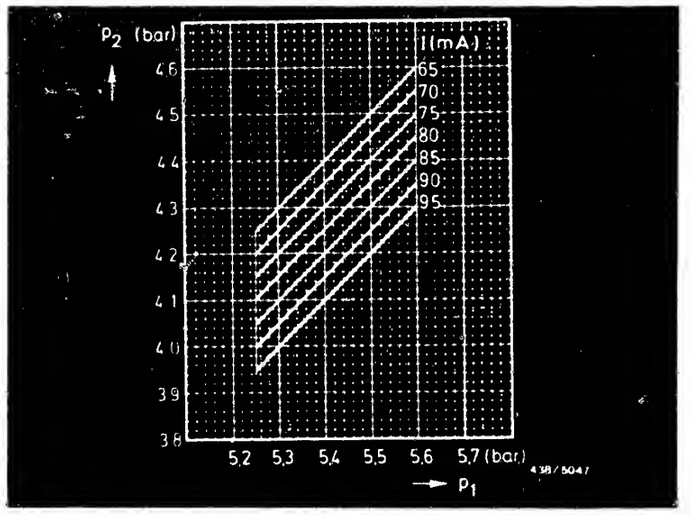
Note the tolerance of ± 0.15 bar which must be added to each characteristic curve.

If the pressure is above or below the required lower-chamber set-value pressure, the cause lies with the electrohydraulic pressure controller. Replace the pressure controller.

To do this, clean the fuel distributor in the region of the pressure controller. The new pressure controller is only supplied as a parts set with seal rings and fastening screws. Always mount the pressure controller with new seal rings and original fastening screws (non-magnetic steel).



P_1 = Primary pressure
P_2 = Lower-chamber pressure "cold" Tolerance + 0.15 bar
I = Controller current



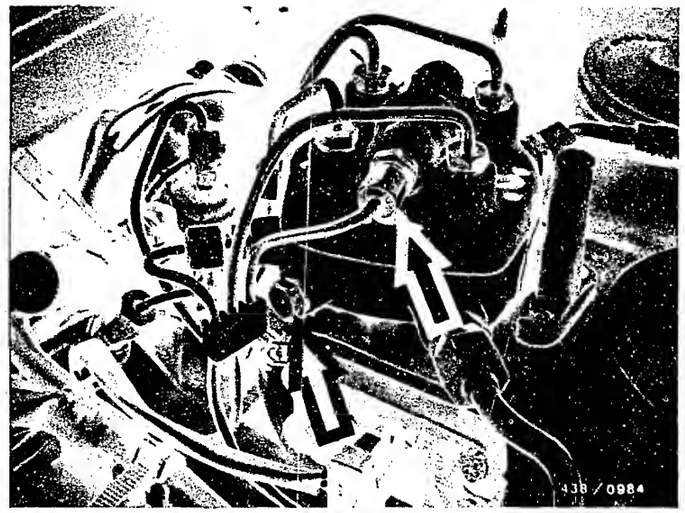
15.3 Testing the overall fuel system for internal leaks

Fitting the pressure tester KDJE-P 100

Fit using connecting-parts set KDJE - P 100/10 and .../11.

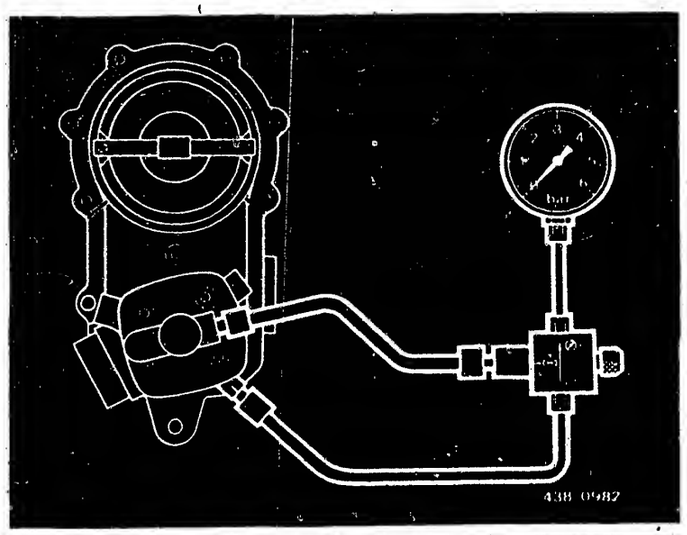
Important:

There is a special measuring bore on the bottom part of the housing of the fuel distributor for connecting the pressure tester. During operation, this bore is closed with a screw. (Picture - bottom arrow). Before opening the screw plug, the remaining pressure in the primary-pressure circuit must be removed. To do this, always first of all loosen the connection for the start valve (central connection on fuel distributor) (picture - top arrow).



Using the threaded double fitting M 8 x 1/M 12 x 1.5 from KDJE - P 100/10, connection "A" of the directional-control valve is connected to the measuring bore in the fuel distributor.

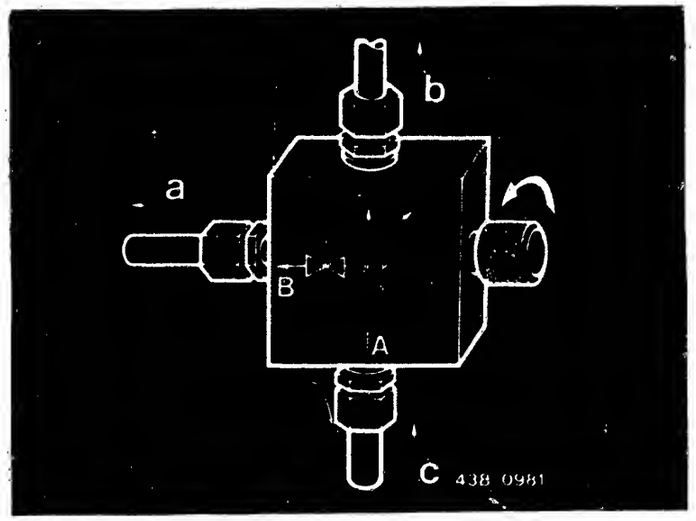
Using the hose line from KDJE- P 100/11, connection "B" is connected to the connection for the start valve on the fuel distributor.



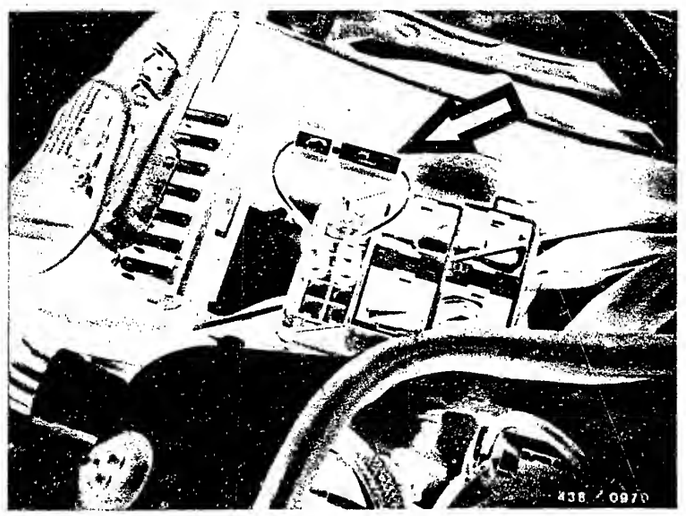
Testing:

The test is performed with the engine stopped.
Perform the test with the engine at normal operating temperature, but not immediately after the engine has been raced and is very hot.

Open the hollow screw of the directional-control valve of the pressure tester (turn in a counterclockwise direction).



Switch on the electrical fuel pump by bridging the electrical safety circuit (bridge pins 7 and 8 in the relay base) until the primary pressure has built up. Then switch off again. Observe the pressure drop on the pressure gauge.



Test specifications for leak test:

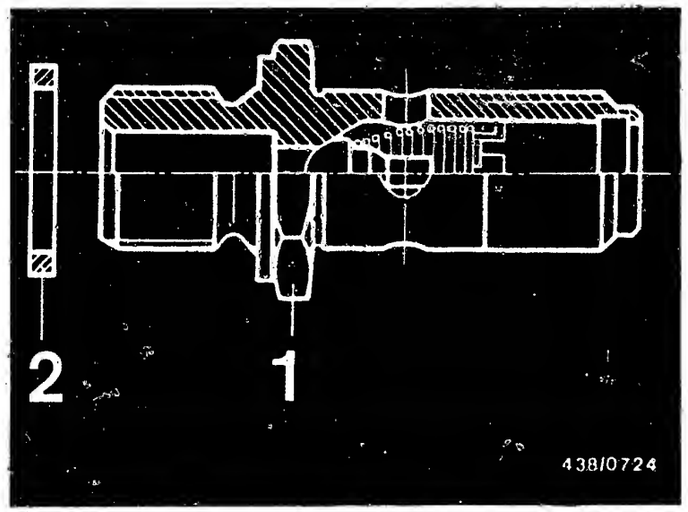
Minimum pressure after 10 minutes: 2.7 bar gauge pressure

Minimum pressure after 20 minutes: 2.6 bar gauge pressure

Possible causes of leaks (pressure drop too fast):

- Non-return valve in tube fitting on delivery side of electrical fuel pump leaking.

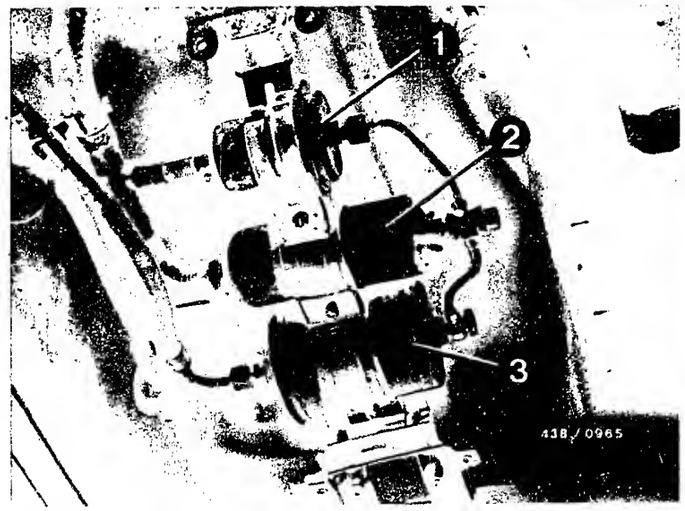
  For testing, pinch off intake line of electric fuel pump (e.g. using hose clamper W 157 from Matra Co.) and repeat leak test. If the leak is now eliminated, replace the tube fitting.
  The new tube fitting (1) is supplied with the corresponding seal ring (2) as a parts set under the part number 1 587 010 006.



Replacing the tube fitting:

Pinch off the intake hose of the electric fuel pump again.

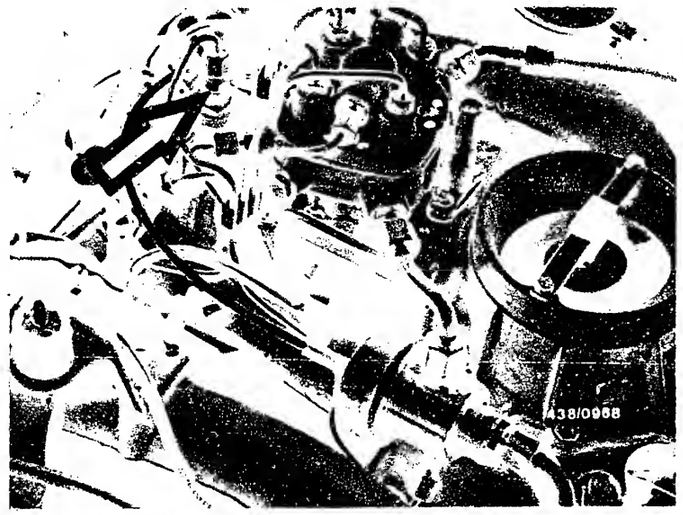
Unscrew the common delivery line from the fuel accumulator (1), electric fuel pump (2) and fuel filter (3).
Apply counter-force at the fixed hexagon. Unscrew the tube fitting and secure the new tube fitting to a tightening torque of 10...16 Nm. Remount the common delivery line.
Use new seal rings for the tube fitting and inlet union.



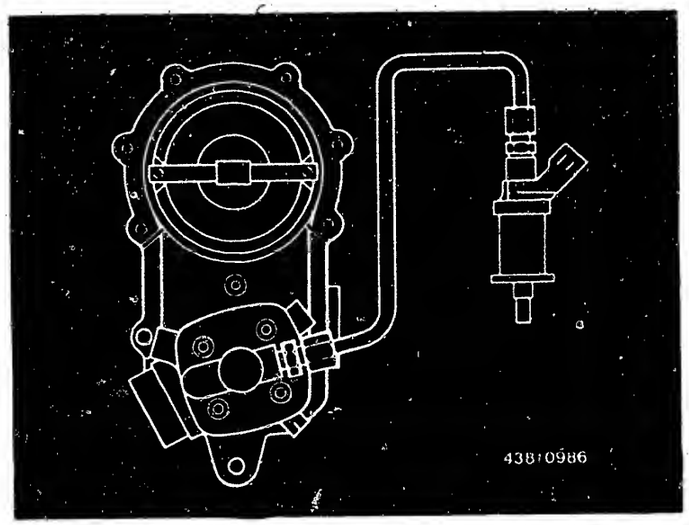
- Start valve leaking.

  Remove the start valve for testing. Apply counter-force at the hexagon of the threaded double fitting in order to loosen the fuel line.

  Likewise unscrew the fuel line to the start valve on the fuel distributor (central connection).



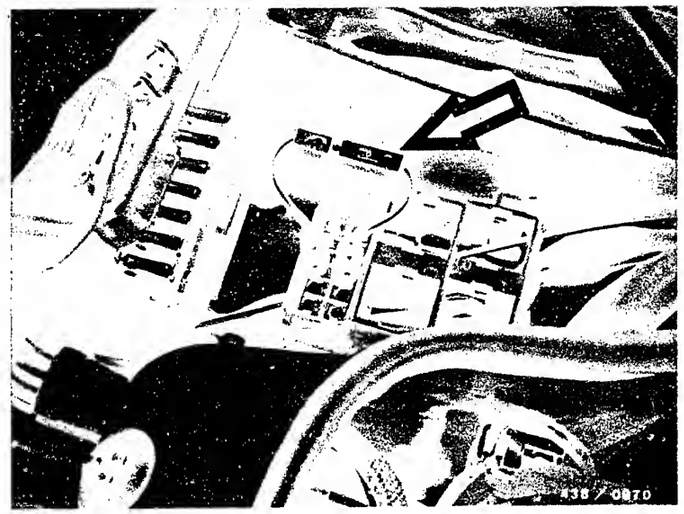
  Using a separate hose line with ball connectors M 10 x 1, connect the start valve directly to the start valve connection of the fuel distributor.



  Switch on the electric fuel pump by bridging the electrical safety circuit. To do this, bridge pins 7 and 8 in the relay base.

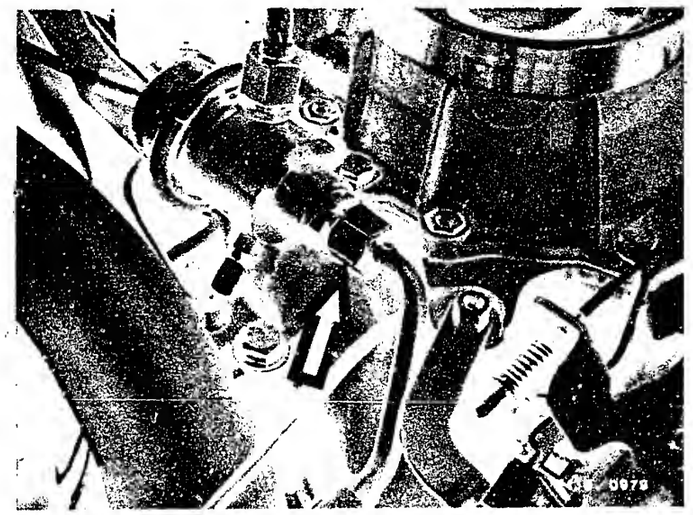
  No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

  If the start valve has had to be replaced due to leaking, the idle adjustment must then be checked and, if necessary, corrected.
  The idle adjustment is described on Coordinate G7.



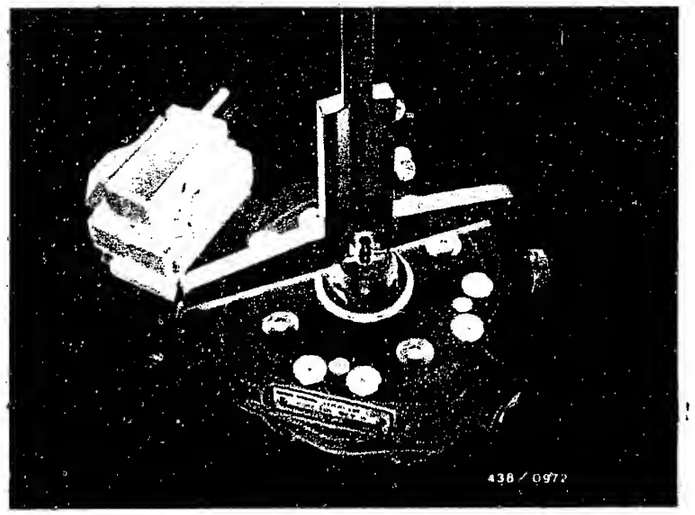
- Diaphragm-type pressure regulator for primary pressure leaking.

  For testing, unscrew the return connection (arrow) from the pressure regulator and seal off tight. If the leak is now eliminated, replace the pressure regulator.



- Seal ring of bottom plunger seal in fuel distributor leaking.

  Clean the fuel distributor, unscrew all fuel connections from the fuel distributor and remove the fuel distributor from the air-flow sensor.

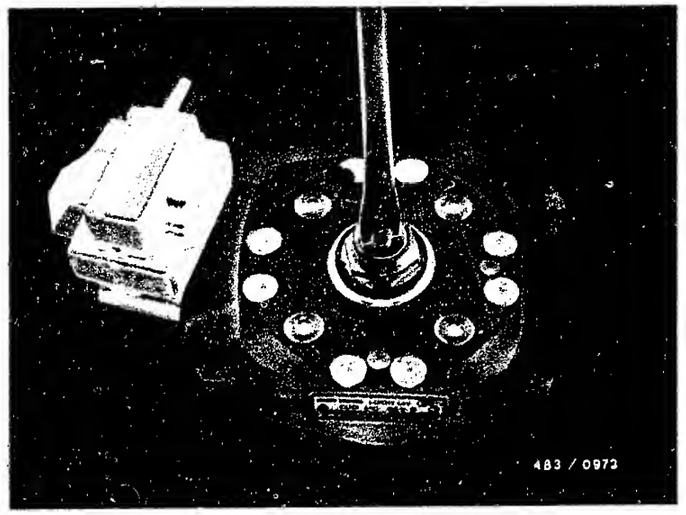


- Using depth gauge, measure position of slotted round nut of plunger seal with respect to fastening nut of barrel with metering slits, and make a note for subsequent re-installation. Also mark the rotary position of the slotted round nut with a mark.

Unscrew the slotted round nut using slotted screw driver.

Carefully change shaped seal ring of slotted round nut (do not damage). Screw in slotted round nut as far as position found when removing and turn to mark.

Remount the fuel distributor on the air-flow sensor. Insert a new seal ring between air-flow sensor and fuel distributor. Tightening torque for fuel distributor fastening screws 3.2...3.8 Nm; observe precisely.



Checking the adjustment of the bottom plunger seal (slotted round nut):

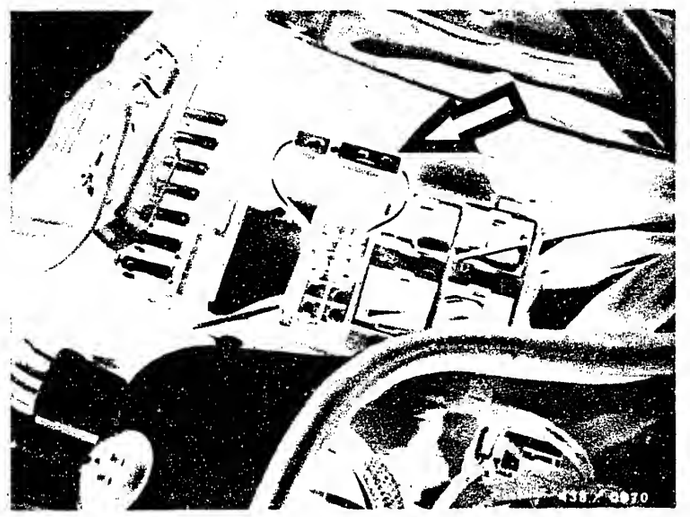
Switch on the electric fuel pump for a few seconds by bridging the electrical safety circuit so that pressure is applied to the control plunger. To do this, bridge pins 7 and 8 in the relay base.

If the position of the air-flow sensor plate is correctly adjusted, the control plunger must not rest on the needle bearing in the air-flow sensor plate intermediate lever. To check, press the sensor plate slightly downward. The air-flow sensor plate lever must have free travel between the zero position and the point at which the control plunger touches. The free travel should be approx. 2 mm measured at the centre of the sensor plate.

If this condition is not met, the fuel distributor must be removed once again - and the position of the slotted round nut must be corrected accordingly.

If the free travel is insufficient, screw in the slotted round nut further, and vice versa.

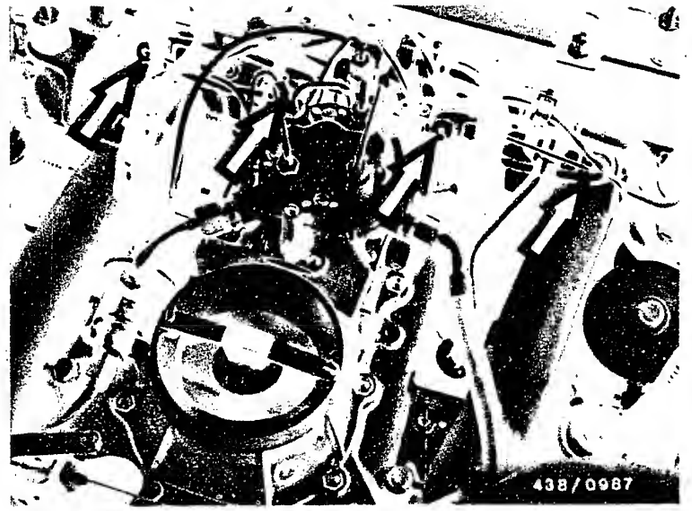
Changing the plunger position/slotted round nut by 0.1 mm corresponds to approx. 0.7 mm at the centre of the air-flow sensor plate.



16. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves. We recommend loosening the fuel-injection tubing at the fuel-distributor as well. The steel fuel-injection tubing must not be bent.

When refitting the injection valves, it is best to replace the O-rings on the valve stem (Mercedes-Benz service part) in order to prevent leaks and thus the entry of unmetered air.



16.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Test gasoline.

Bosch order designation VS 14 942-CH (previously part number 5 973 340 650).
The Bosch test gasoline can be obtained in 5-litre cans from the following supplier:

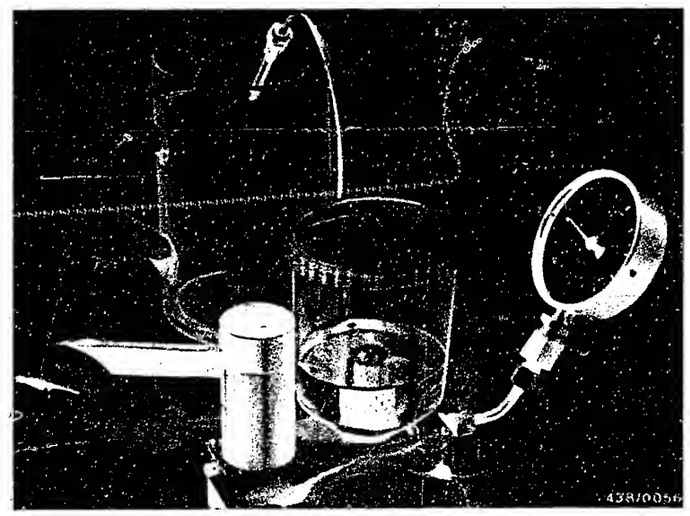
Oskar Gnamm & Co.
D-7531 Kämpfelbach-Bilfingen

Caution:!

For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

16.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.



16.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it). You can try to flush the injection valve clear by moving the lever back and forth several times strongly. If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.

16.4 Testing the opening pressure

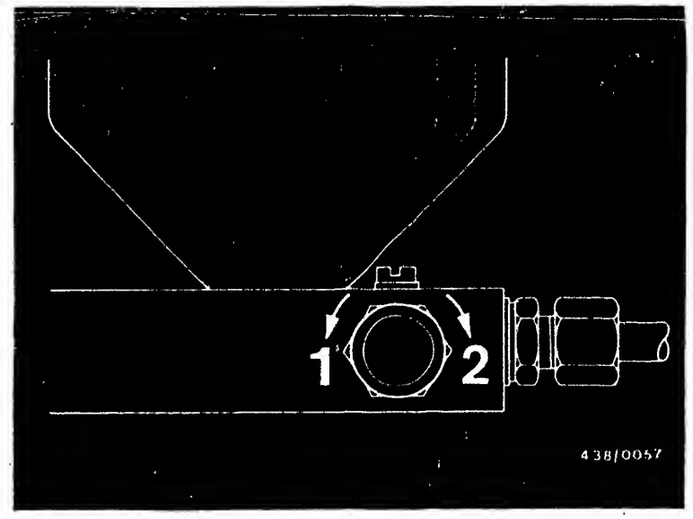
Injection valve	Test specifications - opening pressure
0 437 502 010	3.0 ... 4.1 bar gauge pressure

With the stopcock closed, flush and bleed the valve with several movements of the lever. Open the stopcock and check the opening pressure whilst moving the lever slowly (approx. 2 secs. per stroke).

If the opening pressure is not within the tolerance, change the injection valves. Individual injection valves within a set can also be changed.

16.5 Leakage test

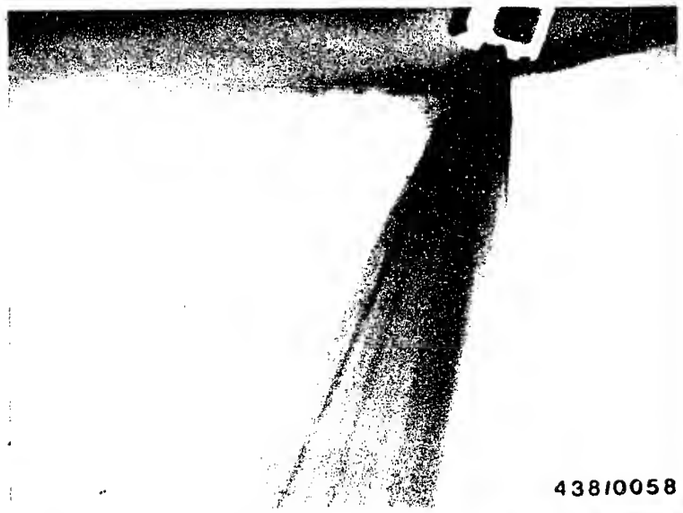
Open the stopcock and increase the pressure slowly to 0.5 bar below the previously calculated pressure and maintain at this pressure.
No drop must fall from the valve for 15 s.



16.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.



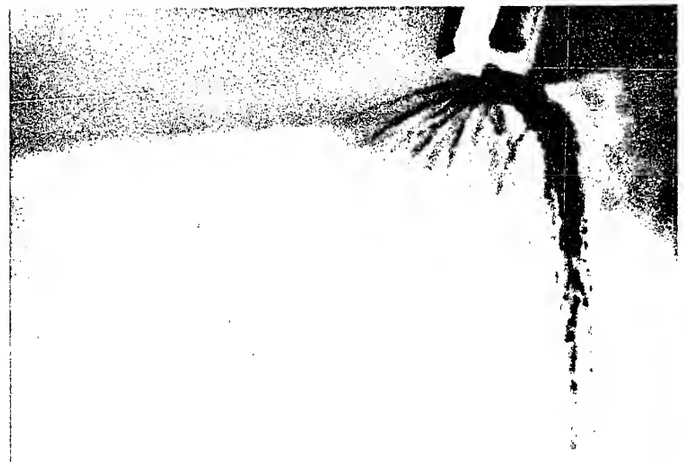
438/0058

Illustration shows single-sided but nevertheless good spray formation.

438/0059

Poor spray formation; replace injection valves.

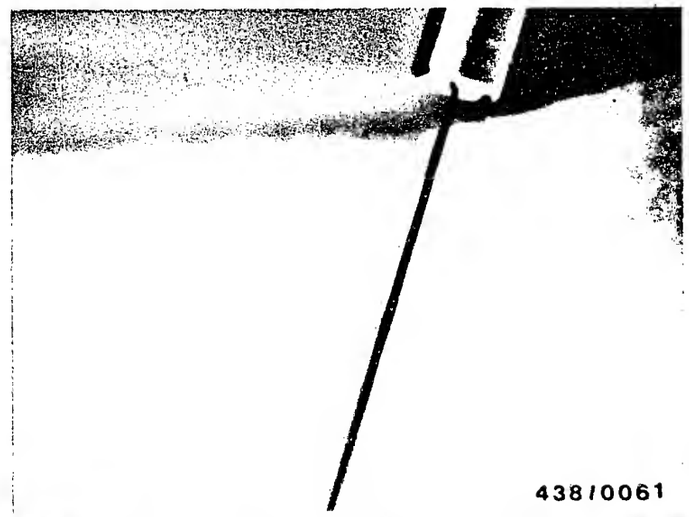
Illustration shows drop formation.



438/0060

Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



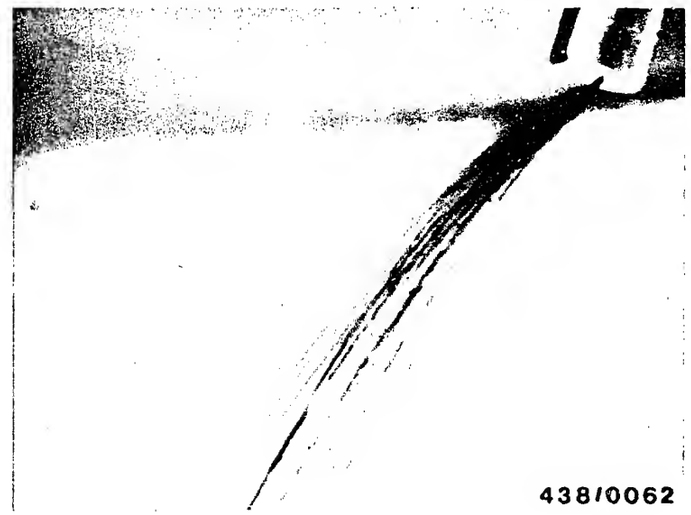
438/0061

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G7.



438/0062

17. Comparative measurement of fuel delivery of fuel distributor outlets

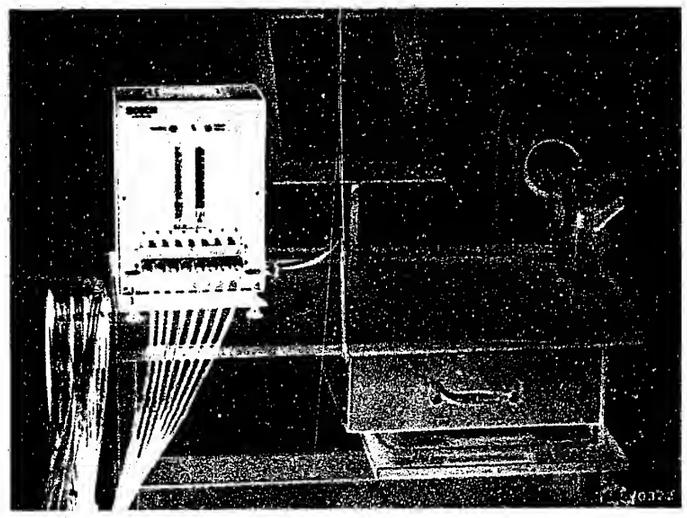
This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

17.1 Application

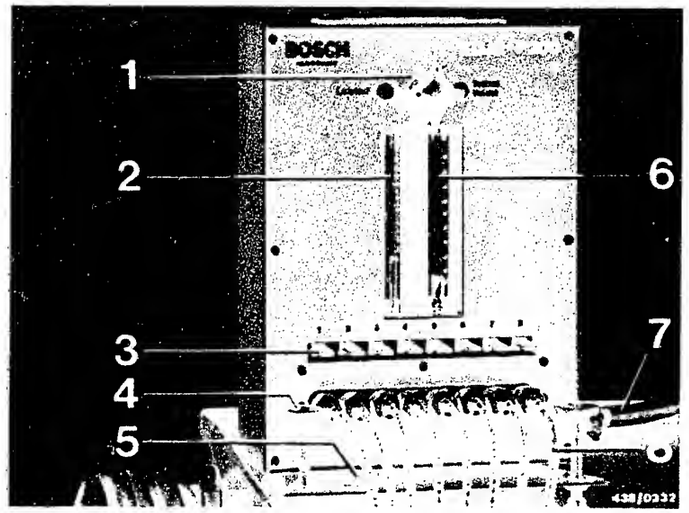
By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined. The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.

17.2 Construction

The tester is designed for all engines up to and including 8-cylinder designs.



1 = Three-way changeover cock
2 = Small test tube
3 = Buttons for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large test tube
7 = Fuel return line
8 = Polyamide hoses (test lines)



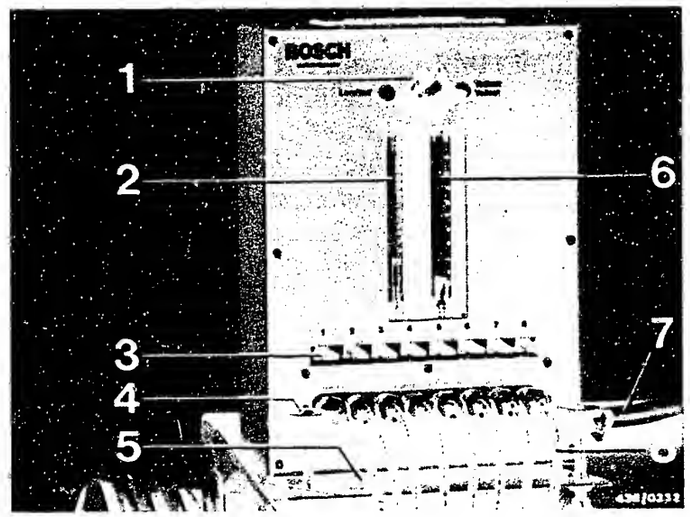
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm³ and 10...180 cm³, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connectors is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.

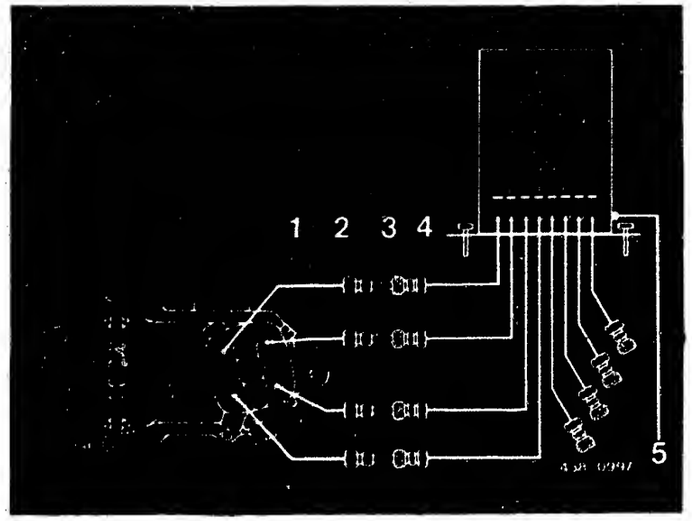


1 = Adapter leads from the cable set KDJE-P 200 / 25
2 = Fuel-injection valves
3 = Snap-on couplers
4 = Equipment lines
5 = Return line to the fuel tank filler neck

17.3 Setting up and connecting the tester for delivered quantity comparison

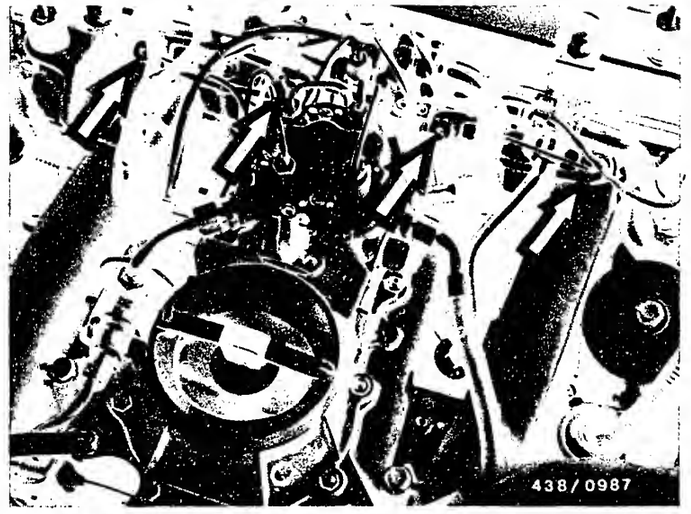
Set the tester up securely next to the vehicle (e.g. on tester trolley KDJE-W 100) and align according to the spirit level (bubble level on base of tester).

To prevent the stiff fuel-injection tubing from becoming kinked, the tester for delivered quantity comparison is used with an adapter cable KDJE-P 200/25.



The injection valves should be removed for the test When loosening the fuel lines, apply counter force at the fixed hexagon of the injection valves. Also unscrew the fuel-injection lines at the fuel distributor. The steel fuel-injection lines must not be kinked.

When refitting the injection valves, it is best to replace the O-rings on the valve stem (Mercedes-Benz service part)in order to prevent leaks and thus the entry of unmetered air.



1 = Adapter leads from the cable set KDJE-P 200 / 25

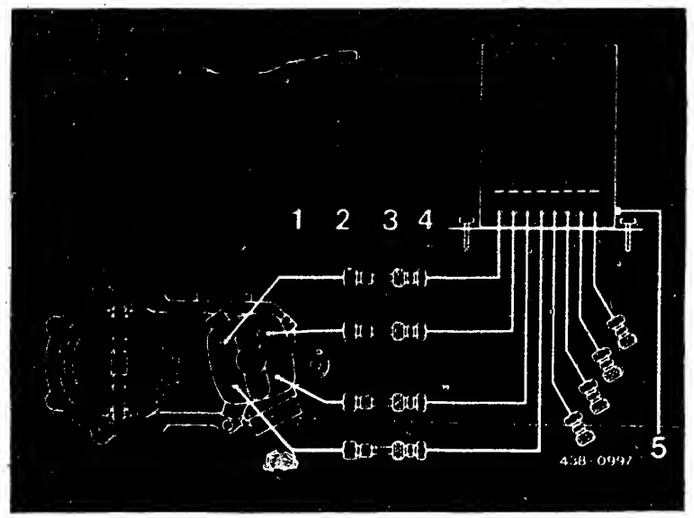
2 = Fuel-injection valves
3 = Snap-on couplers
4 = Equipment lines
5 = Return line to the fuel tank filler neck

Connect the fuel-injection valves to the adapter cables.

Clean the injection valves with a cloth and plug in the correct order into the automatic connectors of the first six tester hoses.

Note:

Plug in the injection valves firmly as far as they will go and tighten the knurled nuts securely so that the non-return valves of the automatic connectors are completely open. Introduce the return hose of the tester into the fuel tank filler neck.



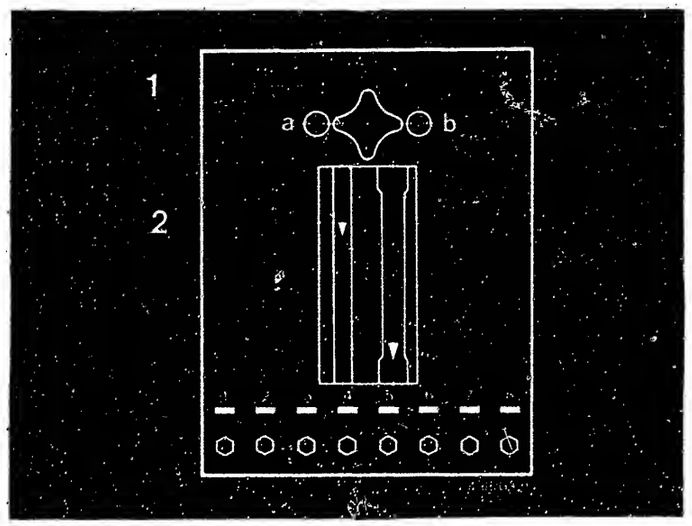
17.4 Bleeding the tester for delivered quantity comparison

Remove the air filter so that the air-flow sensor plate is accessible. Disconnect the electric plug from the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Push the air-flow sensor plate of the auxiliary-air device through as far as it will go.
Press the buttons of the 8-way valve one after the other. In doing this switch over the 3-way changeover cock several times until both rotameter tubes have been bled.
Bring the air-flow sensor plate into the rest position again.

17.5 Testing

The flow comparison measurement is made in the idle, part-load and full-load ranges. The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).

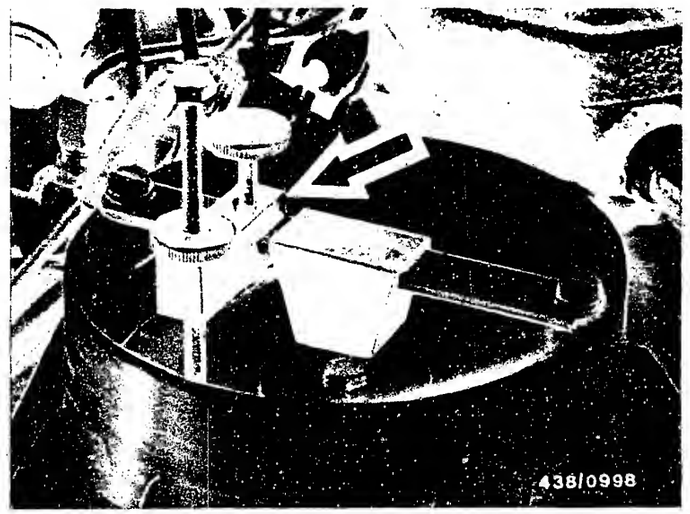
The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.



1 = White dot
2 = Measuring line
a = Idle
b = Part load/full load

The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

With the adjusting screw initially screwed all the way out, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

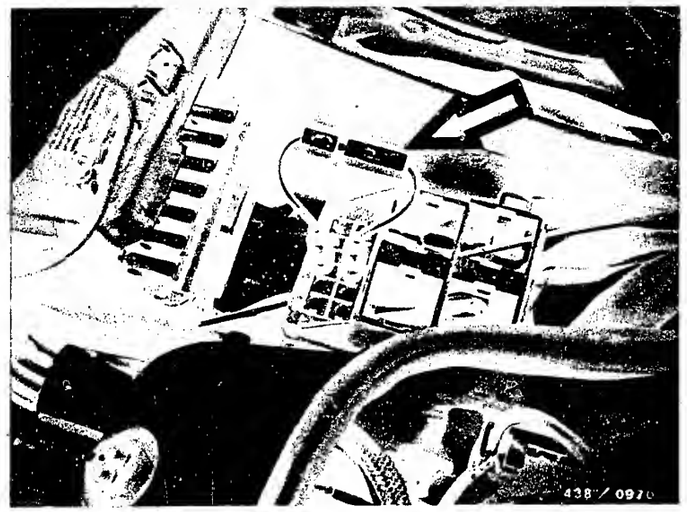


Test procedure

Switch on the electric fuel pump by bridging the safety circuit.
Pull off the cable plug from the electro-hydraulic pressure actuator.

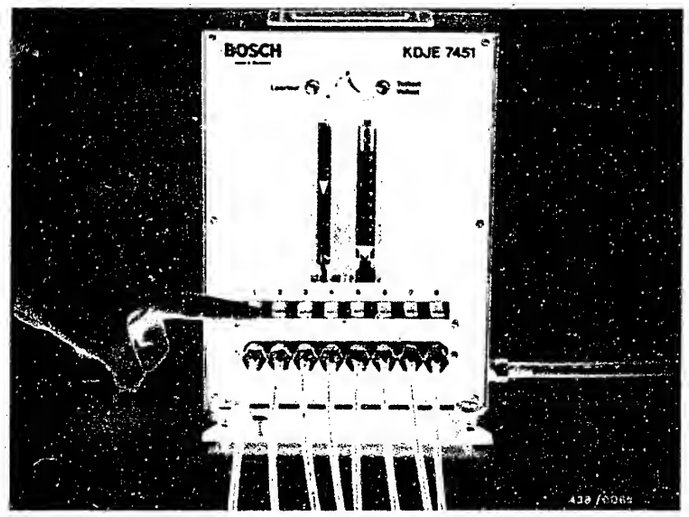
In the following section, fixed limits are given as the maximum permissible delivered-quantity differences for the individual load ranges.

The "setting point" value always refers to the fuel-distributor outlet with the least fuel delivery, i.e. first of all find out which outlet has the least fuel delivery.



Test specifications

Load range	Set point	Max. permissible fuel delivery
Idle	6.0 cm^3/min	6.6 cm^3/min
Part load	40.0 cm^3/min	42.5 cm^3/min
Full load	100.0 cm^3/min	109.0 cm^3/min
Full-load with max. deflection of air-flow sensor flap. Min. delivery of all outlets	140.0 cm^3/min	---------



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

17.6 Concluding work

Check the O-rings on the valve stem for damage. Replace damaged seals (Mercedes-Benz service part).
Fit the injection valves again and reconnect all fuel lines. Make sure that the fuel lines are correctly routed. Connect the electric safety circuit again (fit the relay). Reconnect the plug on the electrohydraulic pressure setting device. Check by means of a test run that there are no leaks in the connections.
Then check the idle adjustment and correct if necessary. The idle adjustment is described on coordinates G7.

18. Testing the correction functions with universal test adapter ETT 018.01-0 684 101 801, KE-Jetronic test lead 1 684 463 135, and commercially available multimeter

18.1 Notes on the following trouble-shooting program

The program is divided into three rows of boxes: the boxes in the left-hand row represent the most convenient sequence of the test steps. Each box also contains all the necessary information on the operation of the universal test adapter and measuring equipment, test conditions, test procedure and test specifications.

The centre row contains the necessary information on how to find and eliminate the fault for each test step.

The right-hand row provides additional information in the way of pictures and sketches, as required.

The sequence of the test steps represents the most convenient procedure. Always go through the entire program since the individual test steps follow on from each other. Only branch to the centre row of boxes if, when performing a test step, the test specifications or other requirements are not met.

18.2 Connecting the universal test adapter:

Note:
In vehicles with ABS, remove the ABS controller before removing the KE controller unit. (Release clamp and take controller out of its mounting with the multiple plug connected).

Slide the KE control unit (arrow) upward in its mounting and remove.

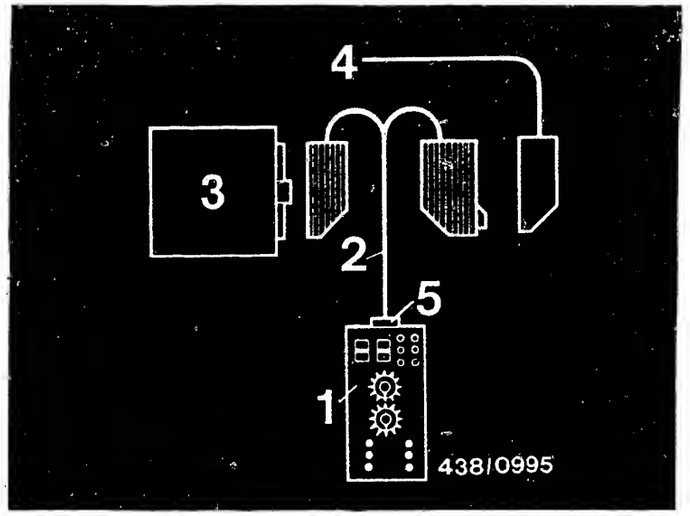
1 = Universal test adapter
2 = System adapter lead
3 = Control unit
4 = System wiring harness
5 = Pin terminal

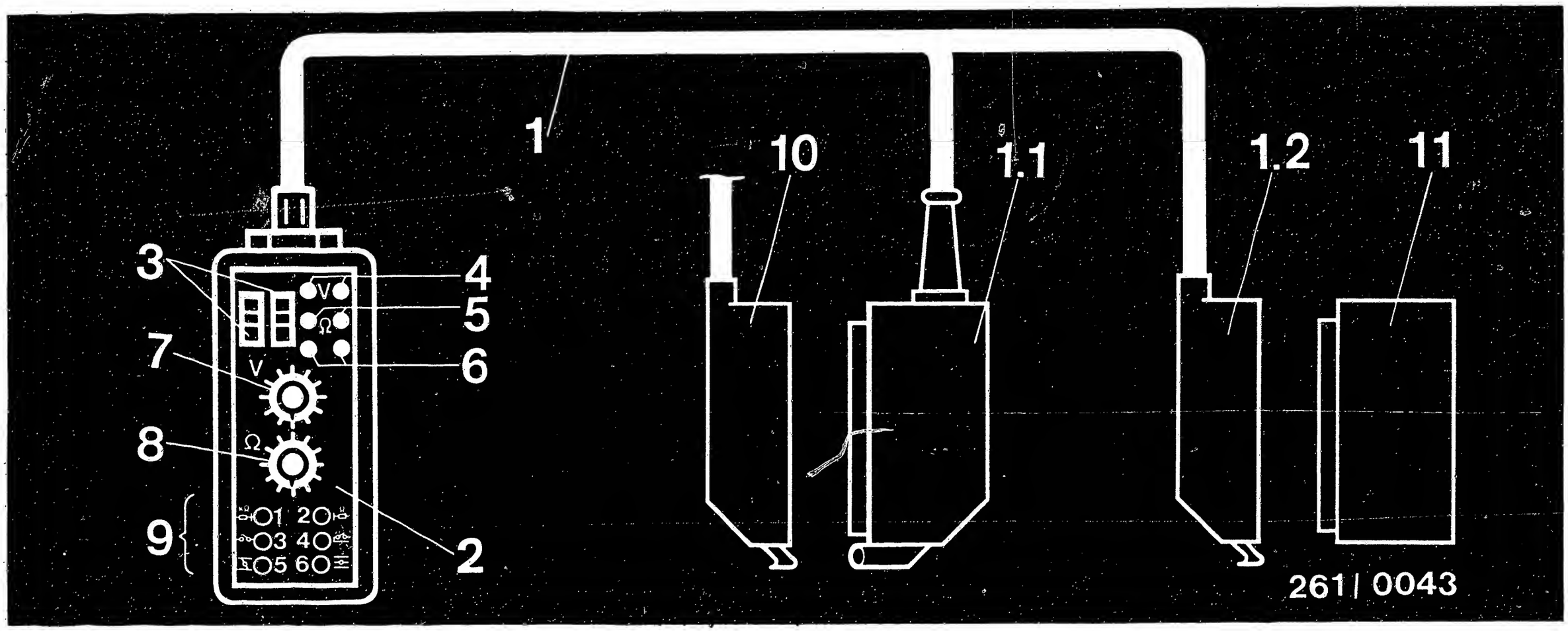
Remove mutliple plug from control unit (push back detent and first of all hinge the plug up on the side of the detent). Connect the plug to the terminal strip of the test lead of the universal test adapter.

The multiple plug of the test lead is intended for connection to the control unit. However, connection must only be made for certain tests in the following test chart. Note the corresponding information in each test step.

Important note:
Make sure that the ignition is off whenever connecting or disconnecting from the control unit.

Connect multimeter (e.g. Miselco Master 50 K) in accordance with manufacturer's instructions to the respective test sockets of the universal test adapter (V, Ω, 1 - 2 for current measurements).





18.3 Construction and use of universal test adapter:

1 = Test lead for KE-Jetronic 1 684 463 135
1.1 = Connection to wiring harness
1.2 = Connection to control unit
2 = Universal test adapter ETT 018.01 - 0 684 101 801
3 = Test wells for motortester (not used for KE-Jetronic)
4 = Test sockets for voltage measurement
5 = Test sockets for resistance measurement
6 = Test sockets for current measurement
7 = Program switch "V"
8 = Program switch "Ω"
9 = Button panel for simulating operating conditions
Button 1 = Simulation of engine "cold" (-20°C)
Button 2 = Simulation of engine "warm" (approx. +80°C)
Button 3 = Not occupied for KE-Jetronic
Button 4 = Simulation of "starting motor operation"
Button 5 = Simulation of throttle-valve switch "idle"
Button 6 = Simulation of throttle-valve switch "full load"
10 = Multiple plug of KE-Jetronic wiring harness
11 = Control unit

18.4 Test chart for universal test adapter

Test 1:

Pressure controller internal resistance.

Plug disconnected from
Remove plug from control unit.
Switch positions

V	Ω	button
↓	4	-

Test specification: 21...25 Ω
Test specification reached?

No →

If resistance ∞Ω:

1. Test for open circuit in leads 10 and 12 from multiple plug to pressure controller.

2. Pressure controller defective. Replace pressure controller.

If resistance outside tolerance:

Pressure controller defective. Replace pressure controller.

Replacing the pressure controller:

Thoroughly clean the fuel distributor in the region of the pressure controller.

Remove the plug and unscrew the pressure controller from the fuel distributor.

The new pressure controller is supplied as a complete parts set with the corresponding seal rings and fastening screws.

Always install the new pressure controller with the new seal rings and the original fastening screws (non-magnetic steel).

Yes ↓

Test 2:

Temperature sensor internal resistance.

Plug disconnected from control unit.
Switch positions:

V	Ω	button
↓	5	-

Test specifications:
+15°...30°C: 1.3...3.6 kΩ
approx. +80°C: 250...390 Ω
Test specification reached?

No →

If resistance ∞Ω:

Test for open circuit in lead 21 from multiple plug to temperature sensor.

If resistance outside tolerance:

Temperature sensor defective.
Replace temperature sensor.

Yes ↓

Continued on F11/F12

Test 3:
Operation of throttle-valve switch "idle"
Plug disconnected from control unit.
Switch positions:

V	Ω	button
↓	9	-

Test specifications:
Test of switching function.
1. Throttle valve closed 0...10 Ω
2. Throttle valve open: ∞Ω
3. Switching point of switch within the free travel in the throttle linkage before throttle valve is moved.
Test specifications reached?

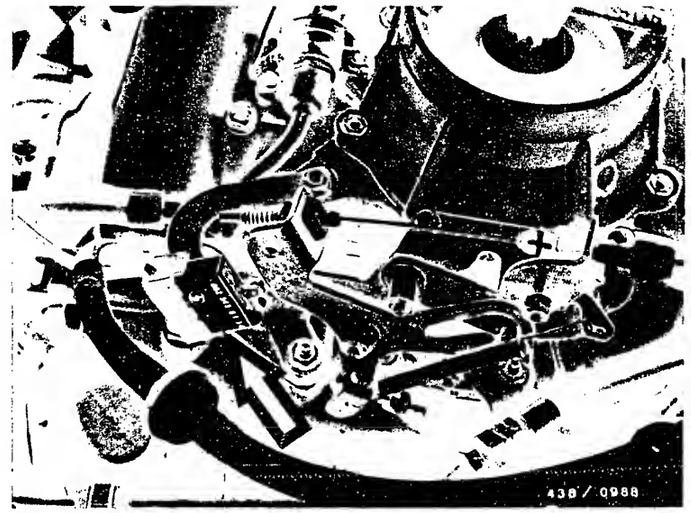
No →

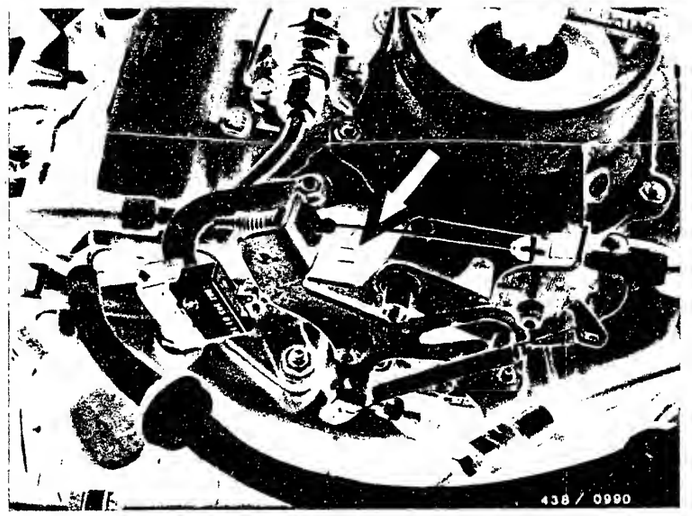
Test switching function directly at throttle-valve switch using ohmmeter. Replace throttle-valve switch if defective (Daimler-Benz service part).

If switching function O.K., test for open circuit in leads 6 and 13 from multiple plug to throttle-valve switch.

Adjusting the throttle-valve switch:
Adjust the switching point by turning the switch inside the mounting holes.

The adjustment is correct if the switch switches immediately when the throttle linkage is actuated, at the start of the free travel before the throttle valve moves.





Yes ↓

Test 4:
Operation of throttle-valve switch "full load"
Plug disconnected from control unit.
Switch positions:

V	Ω	button
↓	10	-

Test specifications:
Test of switching function.
1. Throttle valve closed: ∞Ω
2. Throttle valve fully open: 0...10 Ω
Test specifications reached?

No →

Test switching function directly at throttle-valve switch using ohmmeter.
Note: The connecting lead of the throttle-valve switch can be undone at a cable-to-cable double connector (in the area of the hybrid ignition trigger box).
Replace throttle-valve switch if defective (Daimler-Benz service part).

If switching function O.K., test for open circuit in leads 5 and 6 from multiple plug to throttle-valve switch.

Yes ↓

Continued on F13/F14

Test 5:
Starting signal
Plug disconnected from control unit.
Switch positions:

Plug disconnected from control unit.
Switch positions:

V	Ω	button
4	-	-

Operate starting motor briefly.
Test specification: 8...15 V
Test specification reached?

No → Test for open circuit in lead from terminal 50 on starting motor, via engine cable connector, via terminal 50 on plug base on electric fuel pump relay, to multiple plug, terminal 24.

Eliminate open circuit.

Yes ↓

Test 6:
TD signal (ignition signal)
Plug disconnected from control unit.
Switch positions:

V	Ω	button
5	-	-

Operate starting motor for a few seconds.
Test specification:
There is no specific test specification. It is sufficient to determine whether the signal is received. Depending on the version of voltmeter, a value around 5 V is indicated.
Test specification reached?

No → Test for open circuit in lead from terminal 1 of ignition trigger box, via the cable connector of the diagnostic socket, via terminal TD on the plug base of the electric fuel pump relay, to the multiple plug, terminal 25.

Eliminate open circuit.

Yes ↓

Test 7:
Power supply for control unit
Plug disconnected from control unit. Switch positions:

V	Ω	button
6	-	-

Switch on ignition.
Test specification 8...15 V
Test specification reached?

No → Test for open circuit in lead from terminal B+ in the central electrics console, via the electronic relay (with fuse), terminals 30 and 87, to the multiple plug terminal 1.

Eliminate open circuit

Yes →

Continued on F15/F16

Test 8:
Power supply for potentiometer on air-flow sensor.

Switch positions:

V	Ω	button
7	-	-

Switch off ignition.
Connect multiple plug to control unit.
Switch on ignition.

Test specification: 7...8 V

Test specification reached?

No →

If no reading:
Test for open circuit in lead from multiple plug terminal 18 to potentiometer terminal 18.

Eliminate open circuit.
If reading incorrect or if no open circuit:
Control unit defective.

Replace control unit.

Yes ↓

Continued on F17/F18

Test 9:
Signal of potentiometer on air-flow sensor.

Plug connected to control unit.

Switch positions:

V	Ω	button
8	-	-

Switch on ignition.
Test specifications:
1. Air-flow sensor plate in zero position: 0 V
2. Air-flow sensor plate in basic position. (see top diagram) 0.2...0.3 V
3. Deflect air-flow sensor plate by hand: voltage rise up to max. 8 V

Test specifications reached?

No →

Yes ↓

1. No signal for all 3 test items:

Test for open circuit in leads 14 (-) and 17 (wiper voltage) from multiple plug to potentiometer

If open circuit is not the cause, test potentiometer directly at the connection pins for open circuit using ohmmeter.

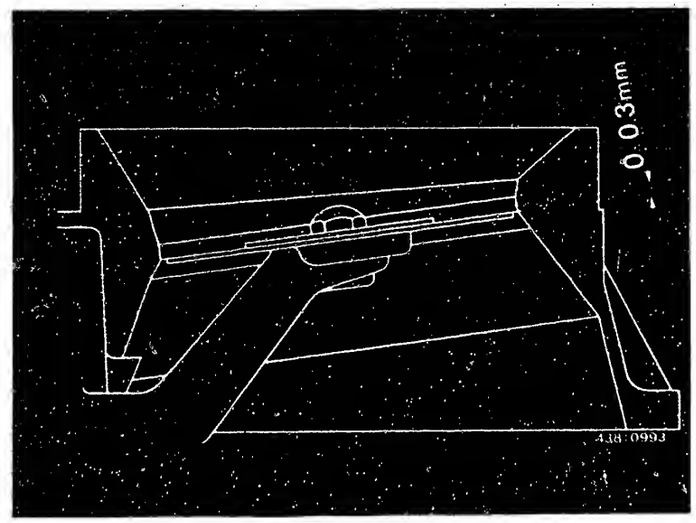
If defective, replace potentiometer and adjust (see 3.)

2. Incorrect readings for all 3 test items:
Adjust the potentiometer (see 3.). If adjustment is not possible, replace potentiometer and adjust.

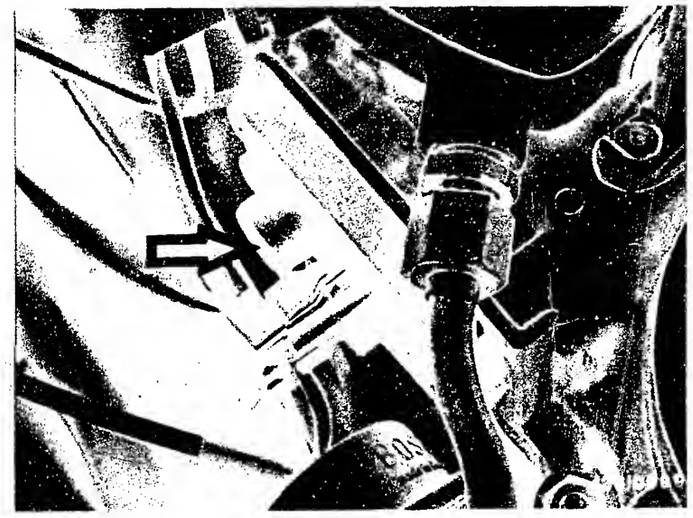
3. Replacing and adjusting the potentiometer:
Scrape off sealing compound from all 4 fastening screws and unscrew complete potentiometer housing.

Important: The sensitive potentiometer wiper must not be touched. It was set at the factory (position, contact force) and cannot be corrected or replaced.

Carefully screw on the new potentiometer housing with a new seal. Fasten only finger-tight.



Arrow = Potentiometer



Continued on F19/F20

Continued from Coordinates F17/F18

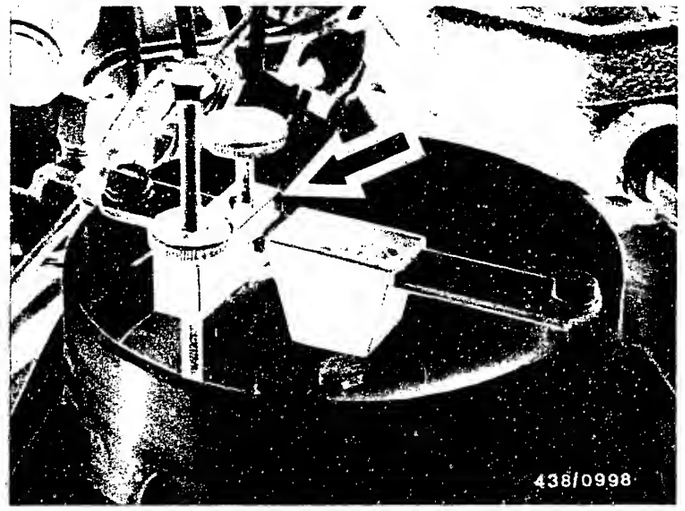
Adjusting the potentiometer:

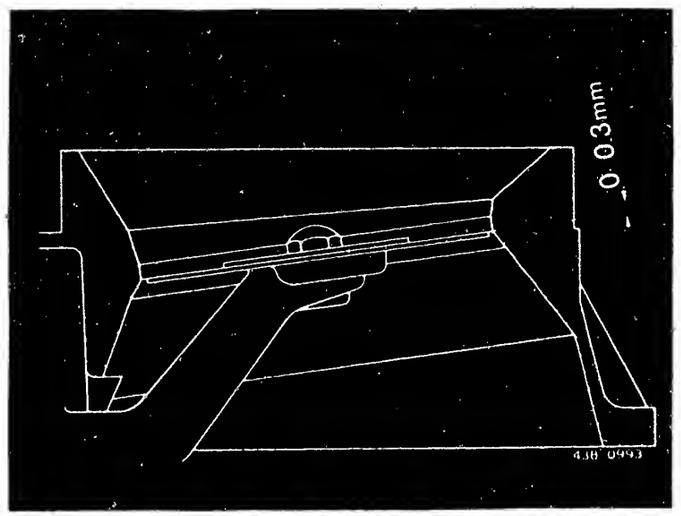
Locate the air-flow sensor plate in the basic position using setting device KDJE 7456.

Definition: Top edge of sensor plate flush with transition edge from cylindrical section to air funnel. Visual assessment on outside of air funnel.

Turn potentiometer housing in the region of the slots so that a voltage of 0.2...0.3 V is indicated.

Tighten the fastening screws to a tightening torque of 5...5.5 Nm. Lock with black sealing compound (e.g. Terroson).





Test step 10:
Power supply to throttle-valve switch - idle and and full load
Plug connected to control unit.
Switch positions:

V	Ω	Button
9	-	-

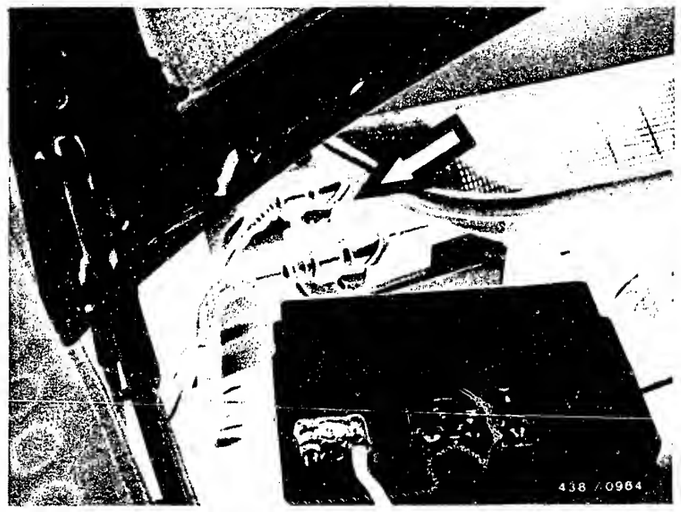
Switch on ignition.
Test specification: 7...8 V
Test specification reached?

No → No reading/incorrect reading:
Control unit defective.

Replace control unit.

Yes

Continued on F21/F22



Test 11:
Warm-up enrichment
(-20°C)

Control unit connected.
Switch positions:

V	Ω	button
-	-	1

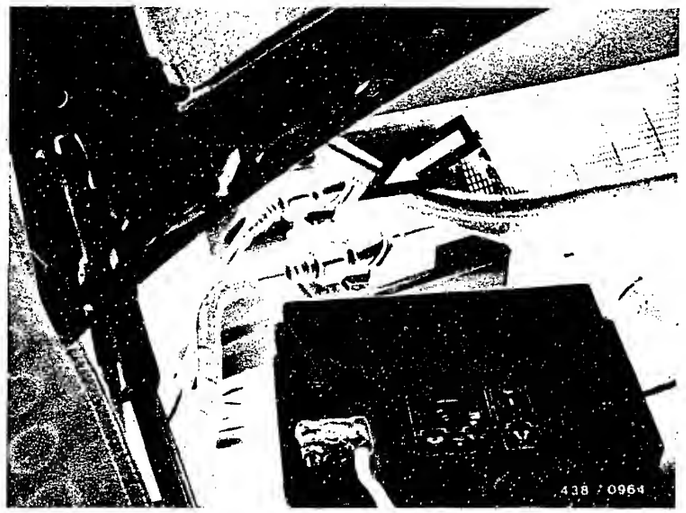
Ammeter measuring range:
0...100 mA.
Switch on ignition.
Test specification: 40...60 mA.
Make a note of reading.
Test specification reached?

No →

No reading or reading incorrect:

Control unit defective.

Replace control unit.



Yes ↓

Test 12:
Shutoff of warm-up enrichment for engine at normal op. temp.

Control unit connected.
Switch positions:

V	Ω	button
-	-	2

Ammeter measuring range: 0...100 mA.

Switch on ignition.
Test specification: 0...1 mA.
Test specification reached?

No →

Higher reading:

Control unit defective.

Replace control unit.

Yes ↓

Continued on F23/F24

Test 13:
Starting enrichment

Control unit connected.
Switch positions:

V	Ω	button
-	-	4

Ammeter measuring range:
0...300 mA

Switch on ignition.

Test specification: 130...150 mA
Test specification reached?

No →

Reading incorrect:

Control unit defective.

Replace control unit.

Yes

Test 14:
Post-start enrichment

Control unit connected.
Switch positions:

V	Ω	button
-	-	1 and 4

Ammeter measuring range:
0...300 m mA.

Switch on ignition.

Test specification: 80...120 mA

Keep button 1 pressed, release button 4. After a brief pause there is a slow fall to the reading in test 11 (40...60 mA).
Test specification reached?

No →

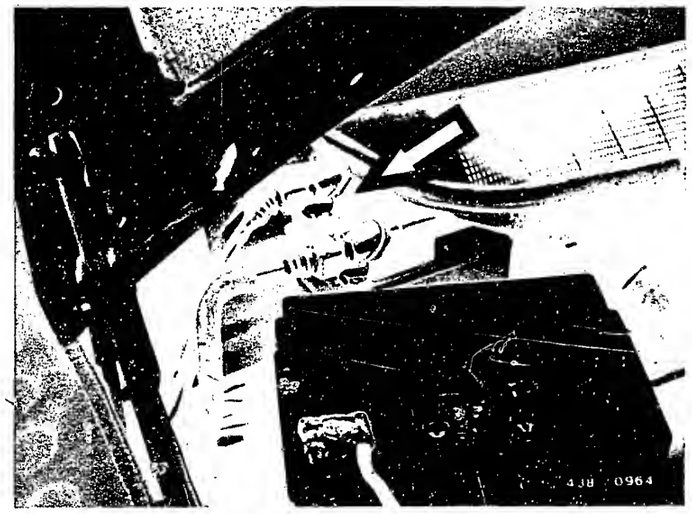
Incorrect reading or incorrect response:

Control unit defective.

Replace control unit.

Yes

Continued on G1/G2



Test 15:
Acceleration enrichment

Control unit connected.

Switch positions:

V	Ω	button
-	-	1 and 6

Ammeter measuring range:
0...300 mA.
Switch on ignition.

Test procedure:
While both buttons are pressed, the reading is the same as that measured in test 11 (40...60 mA). Then deflect air-flow sensor plate. Reading rises to 130... 150 mA and comes down again within 2 secs.
Test specification reached?

No →

Incorrect reading or incorrect response:

Control unit defective.

Replace control unit.

Yes

Continued on G3/G4

Test 16:
Full-load enrichment

Control unit connected.

Switch positions:

V	Ω	button
-	-	6

Ammeter measuring range: 0... 30 mA.

Start engine and hold at 1800 min⁻¹.

Test specification: 4.5...7.5 mA
Test specification reached?

No →

Incorrect reading:

Control unit defective.

Replace control unit.

Yes ↓

Continued on G5/G6

Test 17:
Overrun cutoff

Control unit connected.

Switch positions:

V	Ω	button
-	-	2

Switch polarity of ammeter (swop + and -).
Measuring range: 0...100 mA

Test procedure:

If engine is at normal operating temperature, it is not necessary to operate button.

Start engine and hold at approx. 1500 min^{-1}.
Operate "idle" throttle-valve switch by hand.
Engine hunts. During the phases in which the engine speed drops a reading of 40...50 mA must be indicated.
Test specification reached?

Yes

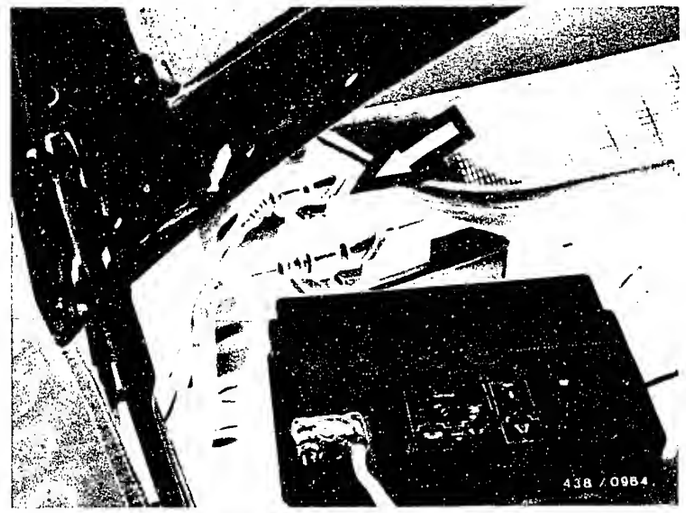
Testing completed.

No

Incorrect reading:

Control unit defective.

Replace control unit.



Test step 18

Idle adjustment

Disconnect universal test adapter and ammeter.
Connect control unit.
Warm up engine (oil temperature approx. 80°C) and operate at idle speed.
Connect CO analyzer and tachometer in accordance with manufacturer's instructions.

Test specification:

Idle speed:
750...850 min^{-1}

Idle exhaust value:
0.5...1.5 % by vol. CO

No

Yes

Test completed.

Adjustment:

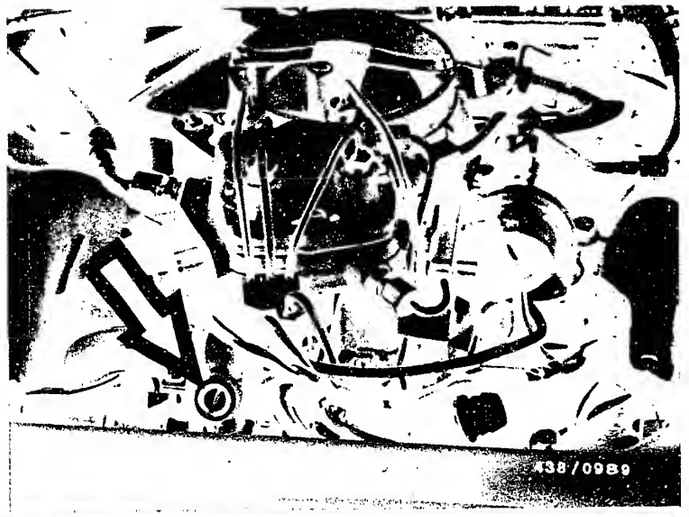
1. Adjust the idle speed with the air filter mounted at the bypass screw shown in the picture (arrow).
2. Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit. Adjust with air filter mounted. Introduce adjusting wrench KDEP 1035 (2) through the special opening in the air filter (arrow). The idle-mixture-adjusting screw is adjusted through the setting device with spring-loaded pin key which is rigidly mounted on the mixture-control unit. To do this, carefully depress pin key with the adjusting wrench until it engages the idle-mixture-adjusting screw.

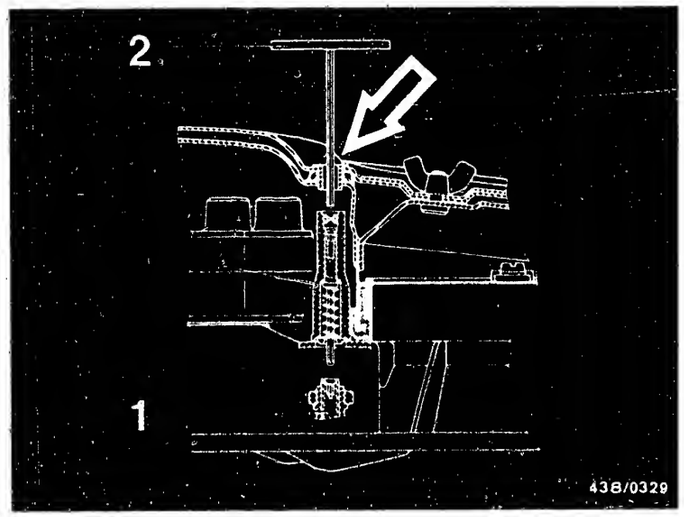
Turning to the right = enriches the mixture
Turning to the left = leans the mixture

Caution:
Remove adjusting wrench after each adjustment. The pin key is forced up by the built-in spring and prevents the entry of unmetered air through the adjustment opening by means of an O-ring seal.

Always make the adjustment from the lean side, i.e. if the adjustment is too rich, first of all turn the idle-mixture-adjusting screw more than necessary to the left, then turn to the right to the desired setting.

Briefly accelerate after each adjustment so that the intake passages cool down. Then wait until the CO reading has settled.





19. Idle adjustment

19.1 Test conditions

Warm up the engine for the idle adjustment (oil temperature approx. + 80°C).

Important information:

If the idle adjustment is being performed without having previously checked the system, disconnect the plug from the electro-hydraulic pressure controller.

After adjusting, connect the plug and check whether this changes the CO concentration. If this is the case, perform the test of the correction functions with the universal test adapter. (Test step 18, Coordinate F4)

If injection lines or injection valves have been loosened or removed, warm the engine up under load. The low fuel throughput at idle is not always sufficient to drive all the air out of the injection lines.

The idle adjustment must not be performed with the engine too hot, e.g. immediately after being raced or after a power measurement on the chassis dynamometer.

In the case of vehicles with air conditioner, switch off the air conditioner for the idle adjustment in order to stabilize the engine speed.

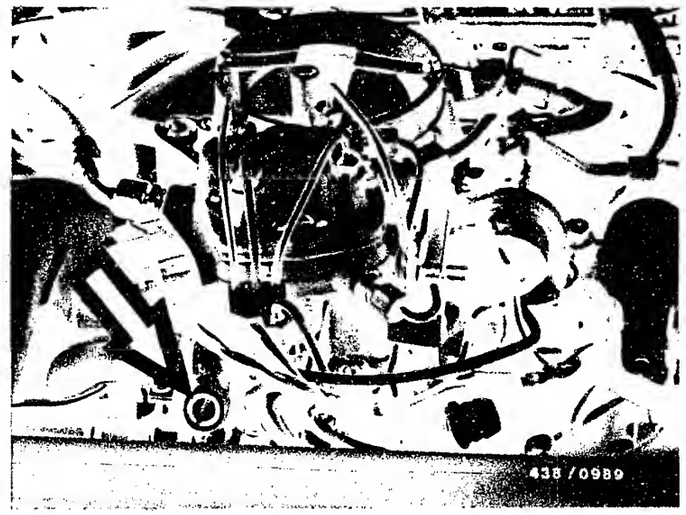
The throttle regulating linkage must be adjusted so that the throttle valve is up against the idle stop free of tension.

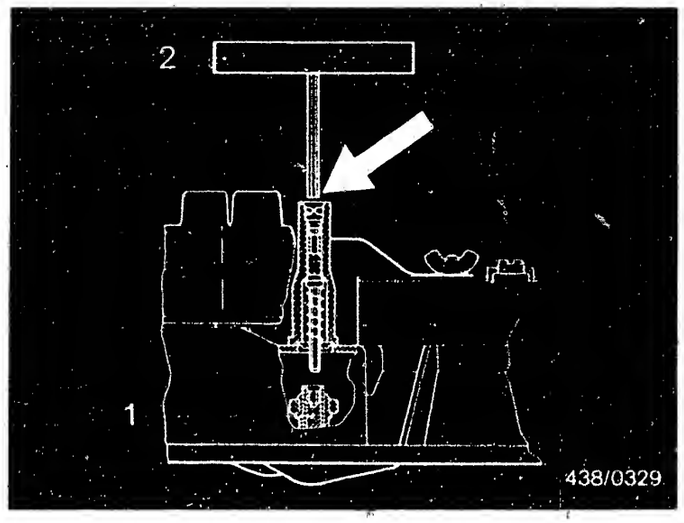
19.2 Test specifications and settings

Idle speed:	750 ... 850 min^{-1}
Idle exhaust value:	0.5 ... 1.5 % by vol. CO

19.3 Testing

The idle speed adjustment is carried out with fitted air filter on the bypass screw shown in the picture (arrow).





Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit.
The CO concentration is adjusted with the air filter fitted. The adjusting wrench KDEP 1035 (2) is inserted through the specially provided opening in the air filter (arrow).
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.
To make the adjustment, carefully press down the hexagon-socket key of the setting device using the adjusting wrench until it locks in position in the idle-mixture-adjusting screw. Remove adjusting wrench after each adjustment. The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

Turning the screw clockwise = richer mixture
Turning the screw counterclockwise = leaner mixture

Please note!

Always make the adjustment from the lean side, i.e. with rich setting turn the idle-mixture adjustment screw more to the left than is necessary and then to the right to the nominal setting.

Remove the adjusting wrench after each adjustment and accelerate briefly in order to cool down the air-intake paths. Then wait until the CO tester display has settled.
Never accelerate with the adjusting wrench still inserted, as otherwise the adjusting lever in the air-flow sensor could be bent.

Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, Paragraph 47 of the FMWSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use. These anti-tamper caps come in different colors.

Use the following cap and color for after-sales service:
In the downdraft air-flow sensor:
Blue safety cap (not available from Bosch)
Mercedes-Benz part no. 000.997.5686
From Deutsche Vergaser Gesellschaft: K 34 520

The anti-tamper device for the air-flow sensor is removed and fitted using special tools (e.g. No. 4521/7 from the firm Hazet, D-5630 Remscheid).

After-sales Service

Technical Bulletin

Continuous Injection System mixture control-unit

VDT-I-438/100 B

Ed. 2 7.1975
Translation of German edition of 1.7.1975

The mixture control unit is still being reported as one defective unit in warranty claims. We wish to point out expressly that the mixture control unit consists of two separate products, the air-flow sensor and the fuel distributor, and that there are separate defect numbers for them in the warranty manual. Please report only the defective product.

Accessory Sets

Various fuel distributors and warm-up regulators have been supplied up to now with pressed-in plug connectors. These will no longer be supplied in future.

	no longer available	Replacement + accessory set
Fuel distributor	0 438 100 002	0 438 100 017
	0 438 100 003	0 438 100 005 + 2 437 001 001
	0 438 100 004	0 438 100 017
Warm-up regulator	0 438 140 002	0 438 140 004 + 1 437 000 000

The accessory sets contain the required number of tailpieces and seal rings.

Please note: the accessory set 2 437 001 000 is delivered included with the fuel distributor 0 438 100 017, and does not therefore need to be ordered separately.

Electric Fuel Pump

In the Technische Mitteilung VDT-BMO 114/1 B and the Service Information sheet VDT-I-740/2-1 B 1st. supplement, we announced that the non-return valve can be replaced on the electric fuel pump 0 580 254 996. We have come to the conclusion from the warranty claims that not enough use is being made of this possibility. Please bear this fact in mind and repair leaky electric fuel pumps before deciding to replace the entire assembly.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich KH
Kundendienst - Technik

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10.1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components orrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung
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After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor
Blue — securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor
Red — Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

BOSCH Geschäftsbereich KH Kundendienst. Kfz-Ausrüstung.

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 (4)	---	---
976	004 (3)	---	---
977	004 (3)	---	---
978	1 587 410 901	---	---
979	010 004 (3)	---	---
980	002	---	---
981	002	---	---
982 (1)	003 (4)	---	---
982 (2)	1 587 410 901	---	---
984	010 004 (3)	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 823 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

KE-JETRONIC

After-sales service procedure

VDT-I-438/109 En

10.1982

Brief description of the system

The KE-Jetronic is a continuously operating gasoline injection system which is electronically controlled.
The difference from K-Jetronic: the warm-up control and additional control functions (e.g. voltage increase for starting and overrun fuel-cutoff) are taken over by an electrohydraulic pressure-correcting element which replaces the warm-up regulator. The pressure-correcting element is fitted directly onto the fuel distributor.

Users

Mercedes-Benz as the first vehicle manufacturer to offer KE-Jetronic, has fitted it to the 190 E (type W 201, starting 10.1982).

Components

Air-flow sensor	0 438 121 001	Fuel filter	0 450 905 406
Fuel distributor	0 438 101 001	Fuel accumulator	0 438 170 038
Pressure-correcting element	2 437 020 003	Start valves	0 280 170 412
Auxiliary-air device	0 280 140 161	Pressure regulator	0 438 161 001
Injection valves	0 437 502 010	Temperature sensor	0 280 130 031
Electric fuel pump	0 580 254 950	Control unit	0 280 800 100

The part numbers are also listed on the vehicle equipment microfiche AA .. .

Service/exchange parts

The air-flow sensor can be partly repaired (for scope of replacement see microfiche EE .. under 0 438 121 ..).
The fuel distributor and the control unit are also available as exchange items (see exchange microfiche WB .. and exchange price list PD 02).

BOSCH

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Testing concept

The testing of the system in the vehicle is carried out not only with the test apparatus used for K-Jetronic, but also with the universal test adapter in conjunction with a special system adapter cable as well as a commercially available multimeter.

Universal test adapter ETT 018.01, part no. 0 684 101 801
System cable part no. 1 684 463 .. (in preparation)
Supplied by Division K7 (Test Equipment).

Technical documentation

Technical Bulletin "New Product" VDT-I-438/3.
Trouble-shooting instructions and test specifications: SIS microfiche MB .. (in preparation).

Training

Technical training for this system is integrated into the courses on K-Jetronic and Jetronic special.

Retrofitting

This system is not intended for retrofitting.

Guarantee procedure

a) Federal Republic of Germany
Components on which a claim is to be made should be sent for inspection during the guarantee period via the relevant Bosch wholesaler to:

K5/QSG
Wareneingang
Am Boschwerk
7000 Stuttgart 30

with guarantee claim form G 20 and delivery slip KH/VKD3 - 15333

b) Other countries
Components on which a claim is to be made should be sent for inspection during the guarantee period to the appropriate representative in your country.

After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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After-sales Service

Motor Vehicle Service Information

UNIVERSAL TEST ADAPTER

VDT-I-Gen. 1001 En
1.1982

1. Application

The multiplicity of different fuel-injection and ignition systems at present available on the market, as well as the advances in development which can be expected in the future, demand a new testing concept. In order to maintain the outlay for test equipment, and hence the costs, at a reasonable limit we have developed the universal test adapter.

The following systems can be tested using a test-adapter universal unit together with adapter leads suited to the system in question:

1.1 Systems which are already being fitted as series:

- L-Jetronic (1st generation)
- LE-Jetronic (2nd-generation L-Jetronic)
- Motronic (with the new connector designation, refer to the vehicle-specific instructions!)

1.2 Systems whose introduction is planned:

- Motronic with gearbox control
- KE-Jetronic
- Mono-Jetronic
- Electronic ignition system with ignition map (EZF)

2. Delivery dates and Part Numbers

Available as from 2.1982.

2.1 Universal test adapter (basic unit)

Part Number: 0 684 101 801

Designation: ETT 018.01

2.2 System adapter lead for LE-Jetronic (2nd-generation L-Jetronic)

Part Number 1 684 463 123

First application: For BMW 2.5/2.8 l engines as from 9.1981, and for Opel 2.0 l engines (Manta/Rekord) as from 9.1981.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

2.3 System adapter lead for Motronic with new connector assignment.

(Refer to the vehicle-related instructions!)

Part Number : 1 684 463 124
First application: Porsche 944 as from series production, BMW as from about 3.1982 (Europe)

2.4 System adapter lead for L-Jetronic (in preparation)

Further system adapter leads will be made available along with the introduction of the new systems as mentioned above.

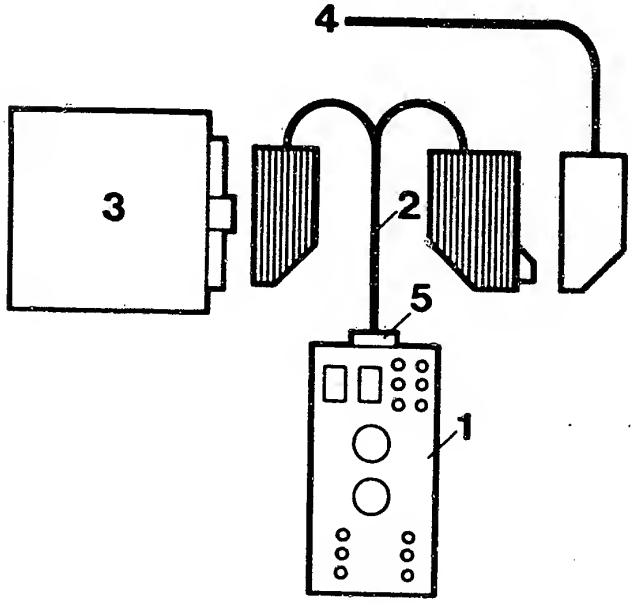
3. Testing procedure

The systems and the components are tested for voltage and resistance values as well as for correct functioning. Evaluation is by means of a multimeter and the Motortester which are connected into the universal test adapter.

Depending upon the complexity of the system, interchangeable adapter lead model 1 or model 2 is provided:

3.1 Adapter lead for peripheral and function testing (Model 1)

The universal test adapter together with the system adapter lead is to be connected to the system wiring harness and to the control unit (e.g. Motronic).
To be tested: Wiring harness with components and control unit.

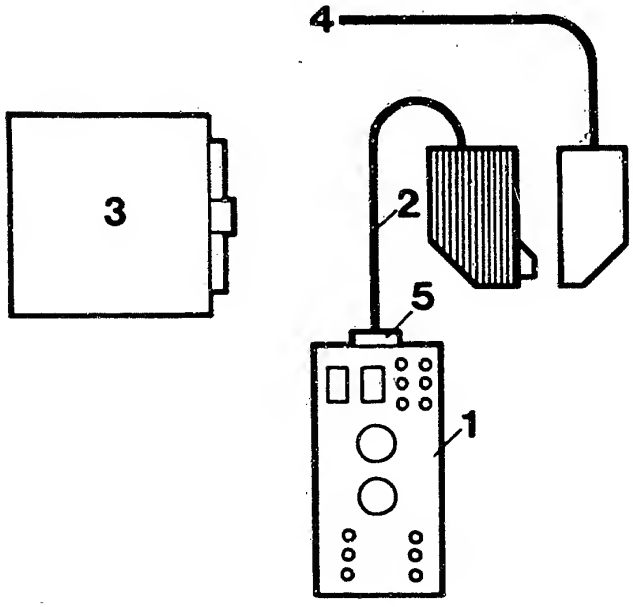


1 = Universal test adapter (basic unit)
2 = System adapter lead (Y-version)
3 = Control unit
4 = System wiring harness
5 = Plug connection

3.2 - Adapter lead for peripheral testing (Model 2)

The universal test adapter with system adapter lead, is only to be connected to the system wiring harness (e.g. LE-Jetronic (2nd-generation L-Jetronic)).

To be tested: Wiring harness with components (without control unit).

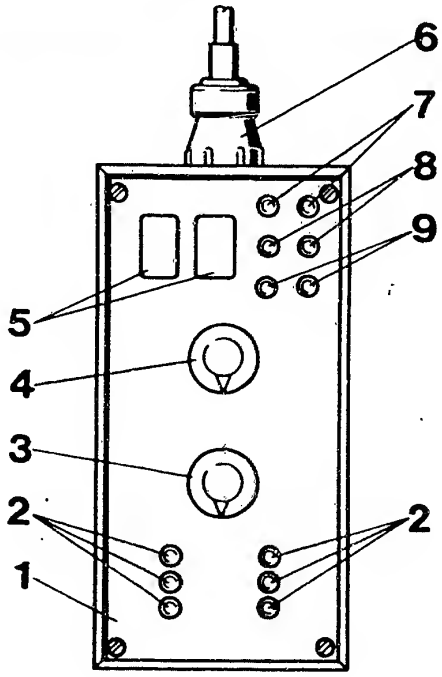


1 = Universal test adapter (basic unit)
2 = System adapter lead
3 = Control unit (not connected)
4 = System wiring harness
5 = Plug connection

4. Construction of the universal test adapters

The universal test adapter is fitted with 2 program switches fooltage and resistance measurement. The measured values are displayed on the multimeter connected to the universal test adapter. For reasons of safety, the voltage and resistance sockets are separated. In order to measure signals (e.g. injection pulses, ignition pulses), it is necessary to connect a Motortester to the measuring cavities (special input).

When carrying out functional tests with the control unit connected, selected push-buttons are pressed in a number of test-program steps in order to simulate a variety of different engine operating conditions the influence of which is evaluated using the Motortester.



1 = Universal test adapter (basic unit)

2 = Keyboard for simulation of various conditions e.g. engine temperature, throttle position etc.

3 = Program switch "Ohm" for resistance measurement

4 = Program switch "Volt" for voltage measurement

5 = Measurement "cavities" (for the special input from the Motortester)

6 = 63-pole plug-in connection for connecting the system adapter lead

7 = Measurement sockets (voltage measurement with a multimeter or with the Motortester)

8 = Measurement sockets (resistance measurement with the multimeter)

9 = Sockets for special functions (not yet allocated)

Notes:

1. The Motronic test adapter (0 684 101 800, ETT 018.00) will continue to be used for Motronic-equipped BMW vehicles (with old connector assignment) up to about year of manufacture 3.1982 (refer to vehicle-specific instructions).

2. Details on the operation of the universal test adapter, and the test specs, are to be found in the vehicle-specific after-sales service instructions.

3. Caution! Change of Part Number:

On the SIS-microfiches OPE-00/J22 (Coordinates A14 and A17) the new Part Numbers are as follows:

Universal test adapter: 0 684 101 801

Adapter lead : 1 684 463 123

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